NHDES-W-06-012

WETLANDS PERMIT APPLICATION

Water Division/ Wetlands Bureau
Land Resources Management

Check the status of your application: www.des.nh.gov/onestop

RSA/Rule: RSA 482-A/ Env-Wt 100-900

Administrative Use Only	Administrative Use Only	Administrative Use Only	File No.
			Check No.
			Amount
			Initials

1. REVIEW TIME: Indicate your Review Time below. To determine review time, refer to Guidance Document A for instructions.

☒ Standard Review (Minimum, Minor or Major Impact) ☐ Expedited Review (Minimum Impact only)

2. MITIGATION REQUIREMENT:

If mitigation is required a Mitigation-Pre Application meeting must occur prior to submitting this Wetlands Permit Application. To determine if Mitigation is Required, please refer to the Determine if Mitigation is Required Frequently Asked Question.

Mitigation Pre-Application Meeting Date: Month: 04 Day: 18 Year: 2018

☐ N/A - Mitigation is not required

3. PROJECT LOCATION:

Separate wetland permit applications must be submitted for each municipality that wetland impacts occur within.

ADDRESS: **I-393 280' west of Mile Marker (MM) 3.4 and 320' west of and MM 4.0**			TOWN/CITY: **Concord-Pembroke**
TAX MAP: **N/A**	BLOCK: **N/A**	LOT: **N/A**	UNIT: **N/A**
USGS TOPO MAP WATERBODY NAME: ☒ NA		STREAM WATERSHED SIZE: **0.77 /0.83 m2** ☐ NA	
LOCATION COORDINATES (If known): **43.235N,71.472W & 43.236N, 71.462W** ☐ UTM ☐ State Plane			☒

4. PROJECT DESCRIPTION:

Provide a brief description of the project outlining the scope of work. Attach additional sheets as needed to provide a detailed explanation of your project. DO NOT reply "See Attached" in the space provided below.

Rehabilitation of an 84"x 394' L corrugated metal pipe (CMP) and twin 54" x 275' L CMPs by lining the pipe inverts with 3" thick reinforced concrete. New stone lining will be placed at the 84" pipe inlet and outlet. Exsiting stone lining at the twin 54" pipes' inlet and outlet will be reset. Stone lining at all pipe inlets and outlets will be graded to meet new invert elevations.

5. SHORELINE FRONTAGE:

☒ NA This does not have shoreline frontage. SHORELINE FRONTAGE:

Shoreline frontage is calculated by determining the average of the distances of the actual natural navigable shoreline frontage and a straight line drawn between the property lines, both of which are measured at the normal high water line.

6. RELATED NHDES LAND RESOURCES MANAGEMENT PERMIT APPLICATIONS ASSOCIATED WITH THIS PROJECT:

Please indicate if any of the following permit applications are required and, if required, the status of the application.

To determine if other Land Resources Management Permits are required, refer to the Land Resources Management Web Page.

Permit Type	Permit Required	File Number	Permit Application Status
Alteration of Terrain Permit Per RSA 485-A:17	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Individual Sewerage Disposal per RSA 485-A:2	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Subdivision Approval Per RSA 485-A	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Shoreland Permit Per RSA 483-B	☒ YES ☐ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED

7. NATURAL HERITAGE BUREAU & DESIGNATED RIVERS:

See the Instructions & Required Attachments document for instructions to complete a & b below.

a. Natural Heritage Bureau File ID: NHB 17 - 2267 .

b. ☐ Designated River the project is in ¼ miles of: _____ ; and date a copy of the application was sent to the Local River Management Advisory Committee: Month: __ Day: __ Year: ____

☒ N/A

8. APPLICANT INFORMATION (Desired permit holder)

LAST NAME, FIRST NAME, M.I.: **Reynolds, Tobey, L.**

TRUST / COMPANY NAME: **NH DOT** | MAILING ADDRESS: **7 Hazen Drive / PO Box 483**

TOWN/CITY: **Concord** | STATE: **NH** | ZIP CODE: **03302-0483**

EMAIL or FAX: **Bureau16@dot.nh.gov** | PHONE: **(603)271-2171**

ELECTRONIC COMMUNICATION: By initialing here: TR, I hereby authorize NHDES to communicate all matters relative to this application electronically.

9. PROPERTY OWNER INFORMATION (If different than applicant)

LAST NAME, FIRST NAME, M.I.: **NA**

TRUST / COMPANY NAME: | MAILING ADDRESS:

TOWN/CITY: | STATE: | ZIP CODE:

EMAIL or FAX: | PHONE:

ELECTRONIC COMMUNICATION: By initialing here _____, I hereby authorize NHDES to communicate all matters relative to this application electronically.

10. AUTHORIZED AGENT INFORMATION

LAST NAME, FIRST NAME, M.I.: **NA** | COMPANY NAME:

MAILING ADDRESS:

TOWN/CITY: | STATE: | ZIP CODE:

EMAIL or FAX: | PHONE:

ELECTRONIC COMMUNICATION: By initialing here _____, I hereby authorize NHDES to communicate all matters relative to this application electronically.

11. PROPERTY OWNER SIGNATURE:

See the Instructions & Required Attachments document for clarification of the below statements

By signing the application, I am certifying that:

1. I authorize the applicant and/or agent indicated on this form to act in my behalf in the processing of this application, and to furnish upon request, supplemental information in support of this permit application.
2. I have reviewed and submitted information & attachments outlined in the Instructions and Required Attachment document.
3. All abutters have been identified in accordance with RSA 482-A:3, I and Env-Wt 100-900.
4. I have read and provided the required information outlined in Env-Wt 302.04 for the applicable project type.
5. I have read and understand Env-Wt 302.03 and have chosen the least impacting alternative.
6. Any structure that I am proposing to repair/replace was either previously permitted by the Wetlands Bureau or would be considered grandfathered per Env-Wt 101.47.
7. I have submitted a Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) to the NH State Historic Preservation Officer (SHPO) at the NH Division of Historical Resources to identify the presence of historical/ archeological resources while coordinating with the lead federal agency for NHPA 106 compliance.
8. I authorize NHDES and the municipal conservation commission to inspect the site of the proposed project.
9. I have reviewed the information being submitted and that to the best of my knowledge the information is true and accurate.
10. I understand that the willful submission of falsified or misrepresented information to the New Hampshire Department of Environmental Services is a criminal act, which may result in legal action.
11. I am aware that the work I am proposing may require additional state, local or federal permits which I am responsible for obtaining.
12. The mailing addresses I have provided are up to date and appropriate for receipt of NHDES correspondence. NHDES will not forward returned mail.

Property Owner Signature	Print name legibly	Date
Tobey Reynolds	Tobey Reynolds	5/29/2018

MUNICIPAL SIGNATURES

12. CONSERVATION COMMISSION SIGNATURE

The signature below certifies that the municipal conservation commission has reviewed this application, and:

1. Waives its right to intervene per RSA 482-A:11;
2. Believes that the application and submitted plans accurately represent the proposed project; and
3. Has no objection to permitting the proposed work.

	Print name **legibly**	Date
⇨		

DIRECTIONS FOR CONSERVATION COMMISSION

1. Expedited review ONLY requires that the conservation commission's signature is obtained in the space above.
2. Expedited review requires the Conservation Commission signature be obtained **prior** to the submittal of the original application to the Town/City Clerk for signature.
3. The Conservation Commission may refuse to sign. If the Conservation Commission does not sign this statement for any reason, the application is not eligible for expedited review and the application will be reviewed in the standard review time frame.

13. TOWN / CITY CLERK SIGNATURE

As required by Chapter 482-A:3 (amended 2014), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.

Town/City Clerk Signature	Print name legibly	Town/City	Date
⇨			

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3,I

1. For applications where "Expedited Review" is checked on page 1, if the Conservation Commission signature is not present, NHDES will accept the permit application, but it will NOT receive the expedited review time.
2. IMMEDIATELY sign the original application form and four copies in the signature space provided above;
3. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
4. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board; and
5. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:

1. Submit the single, original permit application form bearing the signature of the Town/ City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery.

14. IMPACT AREA:
For each jurisdictional area that will be/has been impacted, provide square feet and, if applicable, linear feet of impact
Permanent: impacts that will remain after the project is complete.
Temporary: impacts not intended to remain (and will be restored to pre-construction conditions) after the project is complete.

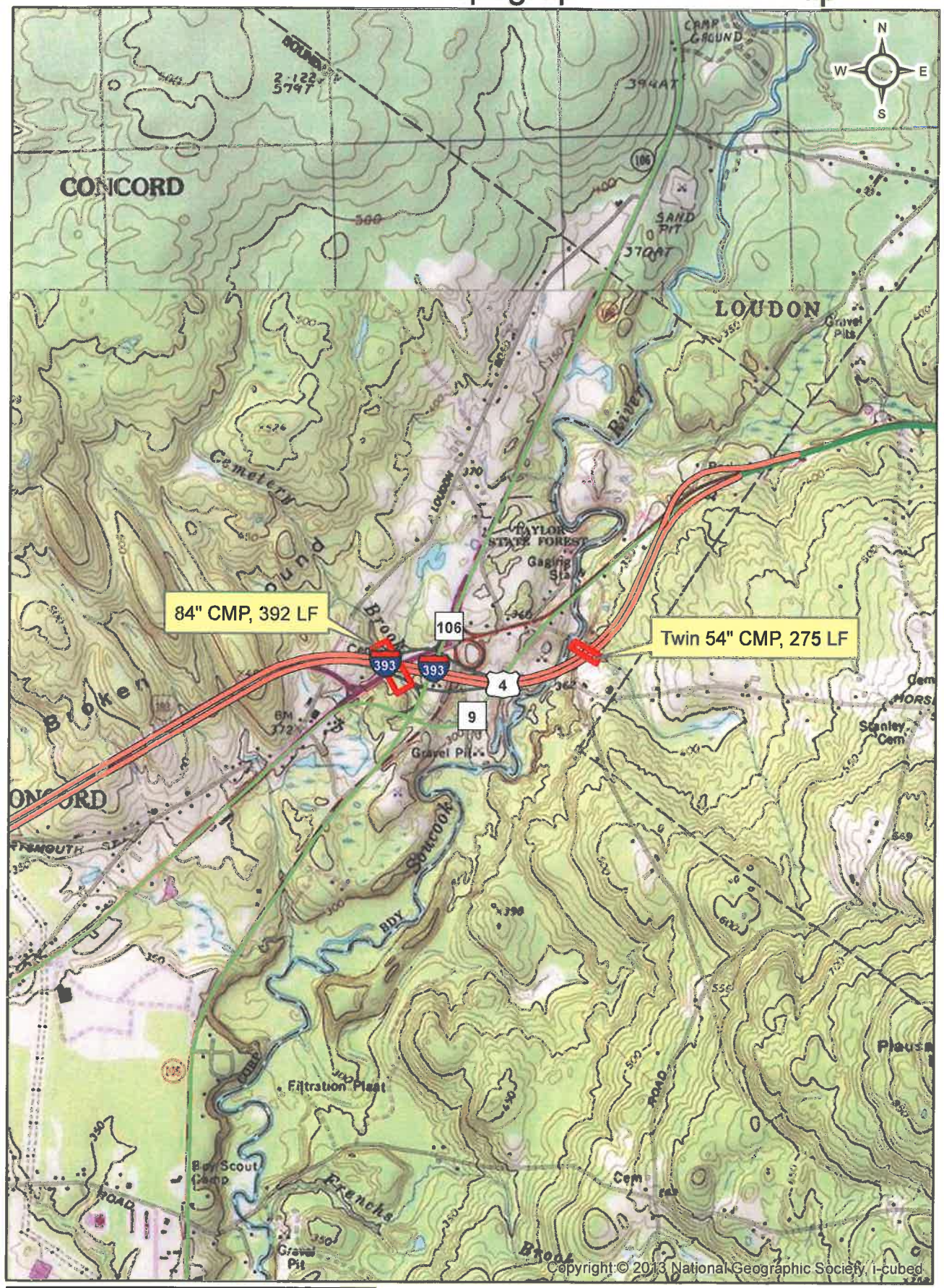
JURISDICTIONAL AREA	PERMANENT Sq. Ft. / Lin. Ft.		TEMPORARY Sq. Ft. / Lin. Ft.	
Forested wetland		☐ ATF		☐ ATF
Scrub-shrub wetland		☐ ATF		☐ ATF
Emergent wetland		☐ ATF		☐ ATF
Wet meadow		☐ ATF		☐ ATF
Intermittent stream		☐ ATF		☐ ATF
Perennial Stream / River	3477 / 980	☐ ATF	1489 / 74	☐ ATF
Lake / Pond	/	☐ ATF	/	☐ ATF
Bank - Intermittent stream	/	☐ ATF	/	☐ ATF
Bank - Perennial stream / River	249 / 72	☐ ATF	2454 / 203	☐ ATF
Bank - Lake / Pond	/	☐ ATF	/	☐ ATF
Tidal water	/	☐ ATF	/	☐ ATF
Salt marsh		☐ ATF		☐ ATF
Sand dune		☐ ATF		☐ ATF
Prime wetland		☐ ATF		☐ ATF
Prime wetland buffer		☐ ATF		☐ ATF
Undeveloped Tidal Buffer Zone (TBZ)		☐ ATF		☐ ATF
Previously-developed upland in TBZ		☐ ATF		☐ ATF
Docking - Lake / Pond		☐ ATF		☐ ATF
Docking - River		☐ ATF		☐ ATF
Docking - Tidal Water		☐ ATF		☐ ATF
Vernal Pool		☐ ATF		☐ ATF
TOTAL	3726 / 1052		3943 / 277	

15. APPLICATION FEE: See the Instructions & Required Attachments document for further instruction

☐ Minimum Impact Fee: Flat fee of $ 200
☒ Minor or Major Impact Fee: Calculate using the below table below

Permanent and Temporary (non-docking)	**7669** sq. ft.	X $0.20 =	**$ 1533.8**
Temporary (seasonal) docking structure:	**0** sq. ft.	X $1.00 =	**$ 0**
Permanent docking structure:	**0** sq. ft.	X $2.00 =	**$ 0**
Projects proposing shoreline structures (including docks) add $200 =			**$ 0**
		Total =	**$ 1533.8**
The Application Fee is the above calculated Total or $200, whichever is greater =			**$ 1533.8**

Concord-Pembroke 41267 Topographic Location Map



0 0.25 0.5 1 Miles

1:24,000

41267 Project Area

WETLANDS PERMIT APPLICATION – ATTACHMENT A
MINOR AND MAJOR - 20 QUESTIONS

Land Resources Management
Wetlands Bureau

Check the Status of your application: www.des.nh.gov/onestop

RSA/ Rule: RSA 482-A, Env-Wt 100-900

Env-Wt 302.04 Requirements for Application Evaluation - For any major or minor project, the applicant shall demonstrate by plan and example that the following factors have been considered in the project's design in assessing the impact of the proposed project to areas and environments under the department's jurisdiction. Respond with statements demonstrating:

1. The need for the proposed impact.

This project will rehabilitate three existing corrugated metal pipe (CMP) culverts, which have significant corrosion located exclusively along the culvert inverts, to prevent further structural damage and prolong their service life.

The first of the three culverts, an 84" diameter CMP, approximately 394' long that carries Cemetery Brook from the north to the south under Interstate 393 and is located within the I-393 Exit 3 limits. The second and third culverts are twin 54" diameter CMPs, approximately 275' long, that carry an unnamed stream from south to north under I-393 and are located approximately 550' east of the Concord/Pembroke town line.

2. That the alternative proposed by the applicant is the one with the least impact to wetlands or surface waters on site.

The project proposes to line the inverts of all three culverts using 3" thick reinforced concrete. Rehabilitation by the proposed method will address the need and purpose for the project while reducing impacts to both Cemetery Brook (Concord) and the unnamed stream (Pembroke). The proposed alternative is also the most practicable considering cost and the benefit gained by extending the service life of the pipes by addressing the primary cuase of deterioation. The full replacement option was considered but would result in much more substantial stream impacts at both locations and a higher total project cost. Other rehabilitation methods, such as sliplining, were explored; however, those methods would have impacts similar to the proposed invert lining alterantive and would result in a more substantial decrease in hydraulic capacity than the proposed method.

3. The type and classification of the wetlands involved.

Cemetery Brook

R2UB1: lower perennial, unconsolidated bottom, cobble-gravel

Bank

Unnamed stream

R2UB1: lower perennial, unconsolidated bottom, cobble-gravel

Bank

4. The relationship of the proposed wetlands to be impacted relative to nearby wetlands and surface waters.

Both Cemetery Brook and the unnamed stream flow to the Soucook River. The crossing carrying Cemetery Brook under I393 is 0.4 miles from the river while culvert rehabilitation work for the twin 54 inch culvert crossing is located approximately 100 feet south of the Soucook River. The stream connectivity and hydrologic landscape support provided by these crossings will not be affected by the proposed work.

5. The rarity of the wetland, surface water, sand dunes, or tidal buffer zone area.

Cemetery Brook and the unnamed stream are both classified as R2UB1 which is not considered to be a rare surface water type in the State of NH. There are no rare wetlands in the project area.

6. The surface area of the wetlands that will be impacted.

Proposed work at the single 84" CMP carrying Cemetery Brook includes 425 sf of temporary bank impact (for access and erosion control BMP installation), 249 sf of permanent bank impact (for placement of stone), 141 sf of temporary channel impact (for erosion control BMP installation) and 1827 sf of permanent channel impact. 1576 sf of the 1827 sf of permanent channel impact is located through the pipe for the installation of the concrete invert liner, the remaining 251 sf of permanent channel impact is for the placement of stone.

Proposed work at the twin 54" CMPs carrying the unnamed stream includes 2029 sf of temporary bank impact (for access, resetting stone and erosion control BMP installation), 0 sf of permanent bank impact, 1348 sf of temporary channel impact (for resetting stone and erosion control BMP installation) and 1650 sf of permanent channel impact. All 1650 sf of the permanent channel impacts are located through the pipe for the installation of the concrete invert liner.

7. The impact on plants, fish and wildlife including, but not limited to:
   a. Rare, special concern species;
   b. State and federally listed threatened and endangered species;
   c. Species at the extremities of their ranges;
   d. Migratory fish and wildlife;
   e. Exemplary natural communities identified by the DRED-NHB; and
   f. Vernal pools.

The proposed project has been reviewed by the NH Natural Heritage Brueau, NH Fish and Game and the US Fish and Wildlife Service. The following findings are based on coordination with these agencies.

a) NHNHB did not identify any rare species in the project area. One species of Special Concern, the wood turtle, was identified in the area. Coordination with NHFG was completed. The design will elminate an existing perch and use wildlife friendly matting. there are no anticipated impacts to this species as a result of the proposed work.

b) NHNHB identifed one State listed endangered species, the brook floater. Coordination with NHFG was completed, there is no concern for impact to this species as a result of the proposed work.

c) There were no species at the extremtities of their ranges identified in the project area.

d) There were no migratory birds, fish or wildlife identified in the project area.

e) NHNHB did not identify any exemplary natural communities in the project area.

f) Streams and surrounding wetlands were delineated by F.B. Envioronmental, several wetland systems were identified in the project area, however, no vernal pools were observed. The project area is limited to the channel and bank of the two perennial stream systems.

8. The impact of the proposed project on public commerce, navigation and recreation.

The project will have no permanent impact to public commerce, or recreation. There will be temporary impacts to I-393 associated with mobilization and staging of the project, including short term lane and shoulder closures. At least one lane of traffic in each direction will remain open to traffic at all times. Delays are anticipated to be of short duration and are not expected to impact public commerce.

9. The extent to which a project interferes with the aesthetic interests of the general public. For example, where an applicant proposes the construction of a retaining wall on the bank of a lake, the applicant shall be required to indicate the type of material to be used and the effect of the construction of the wall on the view of other users of the lake.

There will be no impacts to the aesthetic value of the area, as most of the improvements are contained within the existing culverts, and the culvert inlets and outlets are not within public or private views.

10. The extent to which a project interferes with or obstructs public rights of passage or access. For example, where the applicant proposes to construct a dock in a narrow channel, the applicant shall be required to document the extent to which the dock would block or interfere with the passage through this area.

As Cemetery Brook and the unnamed stream are not navigable waters, there will be no permanent impact to public passage or access. Temporary impacts to traffic during construction will consist of short duration lane and shoulder closures which may result in minor delays. At least one lane of traffic (both eastbound and westbound) will be maintained at all times on I-393.

11. The impact upon abutting owners pursuant to RSA 482-A:11, II. For example, if an applicant is proposing to rip-rap a stream, the applicant shall be required to document the effect of such work on upstream and downstream abutting properties.

There will be no impacts to abutters. The culverts and work areas are within existing State right of way. The rehabilitation of the culverts is not expected to create any significant changes to Cemetery Brook and the unnamed stream. The proposed work will have minimal effect on the ability of the crossings to pass normal and storm level flows and there is no current history of flooding at either location. The proposed placement of riprap at the inlets and outlets of the culverst is to grade the streambed to meet the new invert elevation of the pipes once the lining is installed to the prevent scour and undermining of the pipes, while also providing better conenctivity.

12. The benefit of a project to the health, safety, and well being of the general public.

Rehabilitation of the culverts will prevent the probability that the culverts will fail resulting in the potential closure of Interstate 393 causing hardship to the general public and commerce. Best Management Practices will be implemented during construction to ensure that the water quality of Cemetery Brook and the unnamed brook are protected.

13. The impact of a proposed project on quantity or quality of surface and ground water. For example, where an applicant proposes to fill wetlands the applicant shall be required to document the impact of the proposed fill on the amount of drainage entering the site versus the amount of drainage exiting the site and the difference in the quality of water entering and exiting the site.

The project will have no significant impact on the quantity or quality of surface water or groundwater. The design of the proposed rehabilitation was selected to minimize changes to flow through the project area. Following construction, the culverts, Cemetery Brook and the unnamed brook, are expected to flow in the same way that they do today. BMPs will be incorporated to protect the quality of the surface and groundwater. If the culverts were not rehabilitated, future failures are anticipated, which would most likely have negative impacts on water quality.

14. The potential of a proposed project to cause or increase flooding, erosion, or sedimentation.

The proposed rehabilitation method will not cause any significant change to the culverts' capacity, erosion potential, or sedimentation of the streams. The proposed treatment will increase culvert outlet velocities slightly. At the 84" CMP, stone lining will be placed at the outlet to dissipate energy and reduce velocity. At the twin 54" CMP's, the existing stone lining will continue to prevent erosion. Best Management Practices will be adopted to protect water quality and prevent erosion during construction of the project. The crossings do not currently have a history of flooding and based on existing capacity, the installation of the invert lining will not affect the crossings ability to carrying low and high flows in the project area.

15. The extent to which a project that is located in surface waters reflects or redirects current or wave energy which might cause damage or hazards.

The project will not reflect or redirect currents or wave energy.

16. The cumulative impact that would result if all parties owning or abutting a portion of the affected wetland or wetland complex were also permitted alterations to the wetland proportional to the extent of their property rights. For example, an applicant who owns only a portion of a wetland shall document the applicant's percentage of ownership of that wetland and the percentage of that ownership that would be impacted.

The only permanent impacts to Cemetery Brook by the project are associated with the installation of erosion control armoring to the streambed at the inlet and outlet of the 84 inch culvert. The proposed work perpetuates existing conditions in the project areas, so it is unlikely that any abutting property owners would propose similar impacts to the unnamed stream and to the wetland. The project, as proposed, will not impact abutting properties or change conditions of Cemetery Brook, the unnamed stream, or the Soucook River. Moreover, if the culverts are not rehabilitated, future failures may lead to flooding in the area and the closure of Interstate 393.

17. The impact of the proposed project on the values and functions of the total wetland or wetland complex.

The proposed project design will perpetuate existing conditions in the project area. Once constructed, the culverts will accommodate the flow of Cemetery Brook and the unnamed stream. The functions and values of Cemetery Brook and the unnamed stream will not change due to the proposed work. The streams will continue to carry flow from the higher elevation to lower elevation as well as maintain hydrologic connectivty and aquatic organism passage. Best Management Practices will be incorporated during construction to protect water quality. The conditions of Cemetery Brook north and south of the 84 inch culvert and the conditions of the unnamed brook north and south of the twin 54 inch culverts are not anticipated to change as a result of the proposed project.

18. The impact upon the value of the sites included in the latest published edition of the National Register of Natural Landmarks, or sites eligible for such publication.

There are no sites included in the National Register of Natural Landmarks in the project area.

19. The impact upon the value of areas named in acts of congress or presidential proclamations as national rivers, national wilderness areas, national lakeshores, and such areas as may be established under federal, state, or municipal laws for similar and related purposes such as estuarine and marine sanctuaries.

There are no areas such as those described above located within the project area.

20. The degree to which a project redirects water from one watershed to another.

The project as design will perpetuate existing conditions and will not redirect water from one watershed to another.

Additional comments

NHDOT Concord-Pembroke 41267 Minutes
April 18, 2018 Natural Resource Agency Meeting

Chris Carucci, NHDOT Bureau of Highway Design, gave an introduction to the project including the location and scope of work. This is a culvert rehabilitation project funded under the Federal Culvert Rehabilitation Program and includes two locations under I-393, a single 84" corrugated metal pipe (CMP) and twin 54" CMPs, both constructed in 1987 with moderate rusting of the invert area. This effort is being made to repair these pipes while it is still feasible and before further deterioration occurs and costs and impacts associated with rehabilitation increase.

Location 1 includes the single 84" CMP which carries Cemetery Brook under I-393 just west of Exit 3 in Concord. This pipe is 394' long with stone headwalls, a 2.2% slope, and 9'-11' of roadway fill over the pipe. Streamstats indicated a drainage area of 0.68 square miles, or 435 acres. A field check incorporating closed drainage system inputs indicated a drainage area of 455 acres, both measurements would classify this as a Tier 2 stream crossing. The Streamstats Q50 is 77 cubic feet per second (CFS), the TR55 method predicts a Q50 of 130 CFS (based on 6.2" of rain over 24 hours), and one FHWA regression method predicts a range of 122 – 187 CFS. The current hydraulic capacity is approximately 345 CFS, based on a headwater depth of 8' which is the elevation of the lowest connected catch basin (CB).

Location 2 includes the twin 54" CMPs which carry an unnamed tributary under I-393 to outlet into the Soucook River. These pipes are 275' long with stone headwalls, a 10% slope and 8'-16' of roadway fill over the pipes. Streamstats indicated a drainage area of 0.82 square miles, or 528 acres. A field check incorporating closed drainage system inputs indicated a drainage area of 540 acres, both measurements would classify this as a Tier 2 stream crossing. The Streamstats Q50 is 127 CFS with a range of 70-234 CFS, the TR55 method predicts a Q50 of 260 CFS (based on 6.2" of rain over 24 hours), and one FHWA regression method predicts a range of 244 - 288 CFS. The current hydraulic capacity is approximately 330 CFS, based on a headwater depth of 7', when bypass flow along the roadside ditch would occur.

The preferred alternative is concrete invert repair. Based on the condition of these culverts, 3"–4" of concrete with wire mesh and minimal rebar will be sufficient. This treatment will not significantly affect capacity, but will increase velocity due to the smoother invert. Velocity in low flows will be similar to concrete pipe. At the 84" pipe outlet, a stone apron/channel lining is proposed to dissipate energy and reduce velocity. At the twin 54" location, the previous project included extensive stone lining at the inlet and outlet. We will propose resetting the existing stone as needed to match the new invert elevations and eliminate the perched outlet.

There is no upstream development at either location that would be impacted by headwaters. The outlet of Location 2 is located within the 100 year floodplain and protected shoreland of the Soucook River, however there are no records of flooding issues at either location. The anticipated proposed wetland impacts include:

1. Location 1 (Single 84" CMP):
    a. Upstream: 85 s.f. permanent (18 linear feet) and 275 s.f. temporary

b. Downstream: 400 s.f. permanent (90 linear feet) and 300 s.f. temporary

2. Location 2 (Twin 54" CMPs):
    a. Upstream: 500 s.f. temporary
    b. Downstream: 2100 s.f. temporary

C. Carucci indicated that previous as-built plans show existing stone in all areas where stone placement will occur at Location 2 and therefore mitigation is not required for the work around the twin 54" CMPs as this is considered maintenance of existing infrastructure. Appropriate mitigation will be calculated for permanent impacts associated with stone placement at the single 84" culvert where there is no existing stone. Lori Sommer, NHDES Wetlands Bureau, concurred with this approach for mitigation.

Meli Dube, NHDOT Bureau of Environment, provided an update on the environmental review process. The Design team consulted with Kim Tuttle and John McGee from NH Fish and Game regarding concerns for aquatic and terrestrial organism passage. The concrete invert lining approach will not impede passage. The existing perch at Location 2 will be corrected by resetting existing stone to match the original design for a pool while raising the water depth to the new elevation of the invert liner, which will improve aquatic organism passage at the crossing. Kim Tuttle also suggested using wildlife friendly matting. This project is consistent with the Programmatic Biological Opinion for Transportation Projects within the Range of the Northern Long-Eared Bat and due to the short construction time-frame for this work which will require tree clearing during the northern long-eared bat active season, the project has been given a May Affect, Likely to Adversely Affect finding through consultation with the US Fish and Wildlife Service (USFWS). USFWS Concurrence is anticipated soon. This work also qualifies for the Section 106 Programmatic Agreement and has been given a "No Historic Properties Affected" finding under Appendix B.

Gino Infascelli, NHDES Wetlands Bureau, noted that his GIS layer showed a drainage area of 1.2 square miles for the twin 54" CMPs and asked that we double check our drainage area calculations before submitting the application package*. Carol Henderson, NHFG, asked if reconstructing the stone to recreate the pool at the 54" CMPs would risk washing out again. C. Carucci responded that it is currently unknown if the original stone was built per plan or if the stone moved over time but that the proposed design will be installed correctly using large rocks that are not anticipated to move. M. Dube noted that flooding is not an issue at this location and is probably not the cause of the perch at this site.

*C. Carucci has double checked StreamStats and found that the drainage areas are consistent with those reported during the meeting.

NOTE: THESE ARE DRAFT MINUTES, FINAL MINUTES FROM THE APRIL 2018 NATURAL RESOURCE AGENCY MEETING WILL BE POSTED ON THE NHDOT BUREAU OF ENVIRONMENT WEBSITE

NHDOT Concord-Pembroke 41267
NHDES Wetlands Bureau Standard Dredge and Fill Application
Mitigation Discussion

The proposed project was discussed at the April 18 Natural Resource Agency meeting. The proposed work will result in permanent impacts to the bank and channel of two streams which cross under Interstate 393, including Cemetery Brook and an unnamed stream. The project will install a concrete invert lining through the pipes and place/replace stone at the inlets and outlets to prevent scour, undermining and dissipate energy. Mitigation was discussed and the following approach detailed below was agreed upon. The NHDES Arm Fund Calculator was used to determine mitigation costs.

Cemetery Brook, single 84" CMP:

1. The installation of the concrete invert lining will require 394 linear feet of permanent channel impact through the existing pipe. This is considered maintenance of existing infrastructure and will not require mitigation.
2. The installation of stone at the inlet will require 6 linear feet of permanent impact to the left bank, channel and right bank, totaling 18 linear feet. The installation of stone at the outlet will require 30 linear feet of permanent impact to the left bank, channel and right bank, totaling 90 linear feet. Total linear feet of permanent impact to the bank and channel of Cemetery Brook which will require mitigation is 108 linear feet at a cost of $26,749.44.

Unnamed Stream, twin 54" CMPs

1. The installation of the concrete invert lining will require 550 linear feet of permanent channel impact through the existing pipes, including 275 linear feet per pipe. This is considered maintenance of existing infrastructure and will not require mitigation.
2. The resetting of stone at the inlet and outlet at this location will remain within the area where stone currently exists and is considered to temporary impact as the condition of the streambed is not changing, which will not require mitigation.

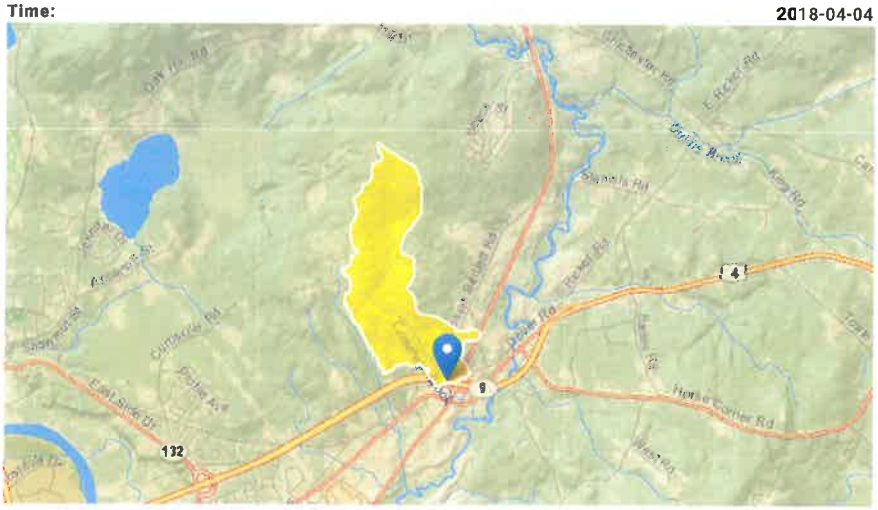
Total mitigation for this project is expected to be $26,749.44.

NHDES AQUATIC RESOURCE MITIGATION FUND
STREAM PAYMENT CALCULATION

INSERT LINEAR FEET OF IMPACT on BOTH BANKS AND CHANNEL	**Right Bank**	36.00
	Left Bank	36.0000
	Channel	36.0000
	TOTAL IMPACT	108.0000
	Stream Impact Cost:	$22,291.20
	NHDES Administrative cost:	
		$4,458.24
********* **TOTAL ARM FUND STREAM PAYMENT**********		
		$26,749.44

Concord-Pembroke 41267 Cemetery Brook (SINGLE 84" CMP)

Region ID: NH
Workspace ID: NH20180404120921566000
Clicked Point (Latitude, Longitude): 43.23500, -71.47201
Time: 2018-04-04 08:09:36 -0400



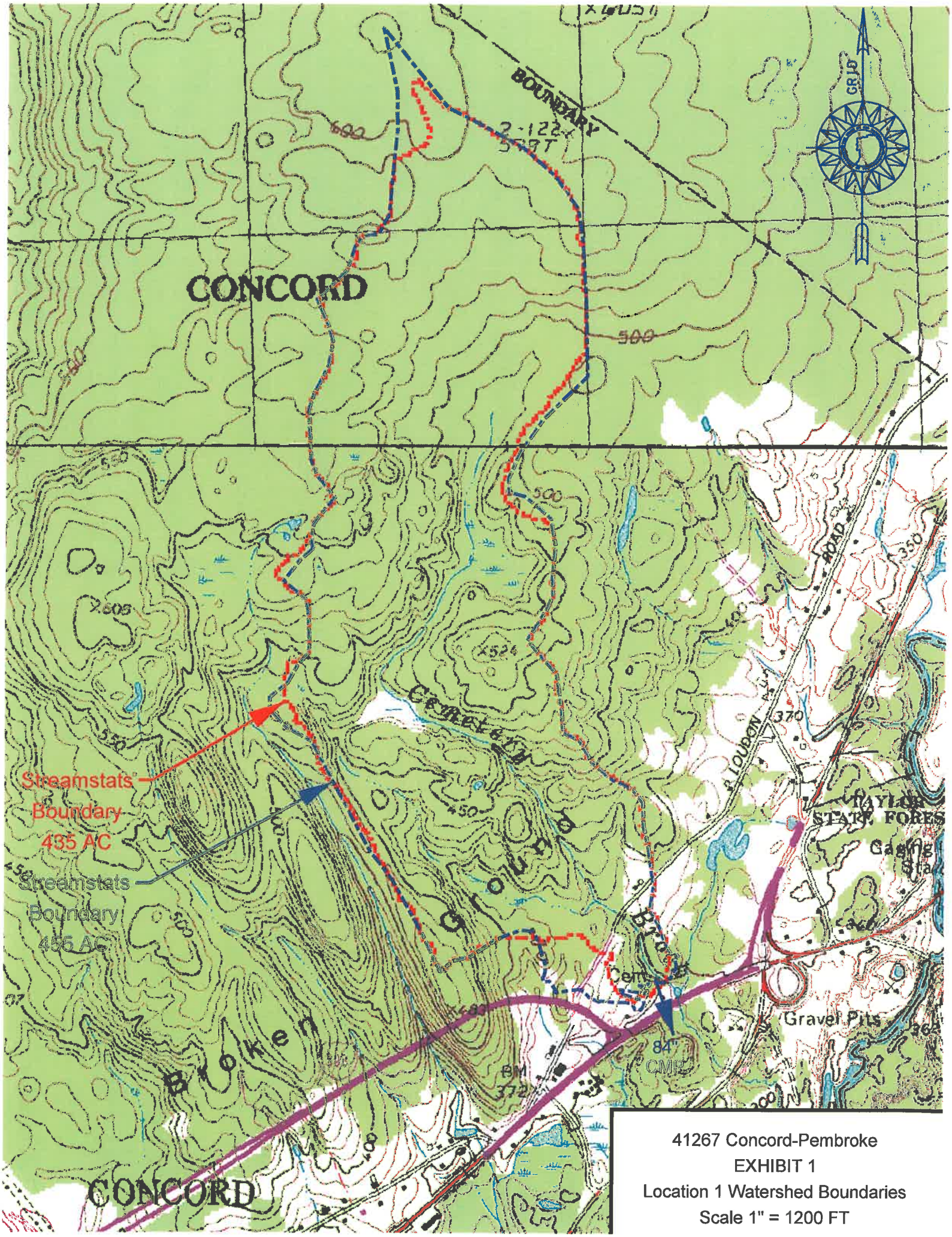
0.77 square miles = 492.8 acres = Tier 2 Stream Crossing

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.77	square miles
CONIF	Percentage of land surface covered by coniferous forest		percent
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	6.65	inches
BSLDEM30M	Mean basin slope computed from 30 m DEM		percent
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest		percent
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	7.8	inches
TEMP	Mean Annual Temperature		degrees F
TEMP_06_10	Basinwide average temperature for June to October summer period		degrees F
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	16.4	inches
ELEVMAX	Maximum basin elevation		feet

Seasonal Flow Statistics Parameters [Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.77	square miles	3.26	689
CONIF	Percent Coniferous Forest		percent	3.07	56.2
PREBC0103	Jan to Mar Basin Centroid Precip	6.65	inches	5.79	15.1
BSLDEM30M	Mean Basin Slope from 30m DEM		percent	3.19	38.1
MIXFOR	Percent Mixed Forest		percent	6.21	46.1
PREG_03_05	Mar to May Gage Precipitation	7.8	inches	6.83	11.5
TEMP	Mean Annual Temperature		degrees F	36	48.7
TEMP_06_10	Jun to Oct Mean Basinwide Temp		degrees F	52.9	64.4
PREG_06_10	Jun to Oct Gage Precipitation	16.4	inches	16.5	23.1
ELEVMAX	Maximum Basin Elevation		feet	260	6290



41267 Concord-Pembroke
EXHIBIT 1
Location 1 Watershed Boundaries
Scale 1" = 1200 FT

NH Department of Transportation
Bureau of Highway Design
Env-Wt 904.06 Repair or Rehabilitation of Tier 1 or Tier 2 Existing Legal Crossings

41267 Concord-Pembroke Location 1 Existing 84" CMP

See attached Stream Crossing Summary information

- In order to qualify under this section, the crossing cannot have a history of causing or contributing to flooding that damages the crossing or other infrastructure. Does the crossing have a history of flooding?
  No, this culvert crossing (84" CMP) has no history of flooding

- Repair or rehabilitation pursuant to this section may be accomplished by concrete repair, slip lining, cured-in-place lining, or concrete invert lining. Please describe how this applies to the subject project.
  The culvert will be rehabilitated by lining the invert with reinforced concrete.

If the above criteria do not apply to this project, the crossing does not qualify under this section and must be designed according to 904.02 (Tier 1 crossings) or 904.05 (Tier 2 crossings).

If the above criteria apply to this project, please provide the following information.

The project may qualify as a **minimum** impact project if:
The crossing does not diminish the hydraulic capacity of the crossing.
The proposed rehabilitation will not have a significant effect on capacity.

The crossing does not diminish the capacity of the crossing to accommodate aquatic life passage.
The stream bed will be graded to meet the culvert's new inverts, maintaining the capacity to accommodate passage of aquatic life.

The crossing meets the general design criteria specified in Env-Wt 904.01, as follows:

Env-Wt 904.01
(a) Not be a barrier to sediment transport;
The proposed rehabilitation will not impact the culvert's ability to transport sediment.

(b) Prevent the restriction of high flows and maintain existing low flows;
The proposed rehabilitation will not significantly change high flow or low flow conditions.

(c) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;
The proposed rehabilitation will not obstruct or otherwise disrupt the movement of aquatic life indigenous to Cemetery Brook beyond the actual duration of construction.

(d) Not cause an increase in the frequency of flooding or overtopping of banks;
The proposed rehabilitation will not have a significant effect on capacity. The Design Flow (Q50) is contained within the banks in existing and proposed conditions. Headwater elevation at the Design Flow does not impact any public or private infrastructure.

(e) Preserve watercourse connectivity where it currently exists;
The proposed rehabilitation allows for the watercourse connectivity to remain as it is today.

(f) Restore watercourse connectivity where: (1) Connectivity previously was disrupted as a result of human activity(ies); and(2) Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;

The proposed rehabilitation will maintain Cemetery Brook's current connectivity.

(g) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and

The proposed rehabilitation will not cause erosion, aggradation, or scouring. Stone lining will be added at the inlet side to prevent scouring under the headwall. Stone lining will be added to the downstream channel to dissipate energy and reduce velocity.

(h) Not cause water quality degradation.

The proposed rehabilitation will not have a permanent effect on water quality. Erosion control best management practices will be used to prevent degradation to water quality during construction.

If the project does not qualify as a minimum impact project due to reasons stated above, it may qualify as a **minor** impact project if:

The crossing does not adversely impact the stability of the stream banks or stream bed upstream or downstream of the crossing.

The proposed rehabilitation will not adversely impact the stability of the stream banks or stream bed upstream or downstream of the crossing. Stone lining will be added to the downstream channel to dissipate energy and reduce velocity.

The crossing does not cause an increase in the frequency of flooding or overtopping of banks.

The proposed rehabilitation will not have a significant effect on capacity. The Design Flow (Q50) is contained within the banks in existing and proposed conditions. Headwater elevation at the Design Flow does not impact any public or private infrastructure.

If the project does not meet the above criteria for minimum OR minor, the crossing does not qualify under this section and must be designed according to 904.02 (Tier 1 crossings) or 904.05 (Tier 2 crossings).

New Hampshire DOT
Department of Transportation

PROJECT	Concord-Pembroke		
PROJECT NO.	41267	ROUTE	I-393
CALCULATED BY	CAC	DATE	5/22/2018
CHECKED BY	JJN	DATE	5/23/2018
SUBJECT	Stream Crossings	SHEET	1 OF 2

Location 1

I-393 Sta 1207+50 **Cemetery Brook** Wetland ID# CS1, Class R2UB1 **Tier 2 Stream Crossing**

Existing Conditions: **Drainage Area** 0.68 sq miles (435 acres) from Streamstats
0.71 sq miles (455 acres) from field review See Exhibit 1

Existing Pipe 84" Corrugated Metal
Length (ft) 394
Slope 2.2%
Upstream Inv 336.95
Downstream Inv 328.10
Manning's n - 0.024

General:
The existing pipe was constructed by Project 10254, Plans dated 1987.
No changes or repairs observed or documented.
No reports of flooding or damage to roadway or private property related to this crossing.
Review of the record plans indicated a portion of I-393 median and south side ditch is connected to the 84" cmp via an 18" cmp, located approximately 115' upstream of the 84" culvert outlet . This adds about 10 acres to the drainage area. Review of the Streamstats boundary vs LIDAR data from GRANIT (UNH's GIS Database) resulted in minor changes to the boundary in the upper watershed, adding another 10 acres of total area.
LIDAR elevations compared favorably with NHDOT ground Survey performed for this project.
Elevations are from NHDOT Survey unless otherwise noted.

Inlet Conditions:
Top of headwall elevation approx 345.0 (about 8' above invert).
Top of roadway embankment is about El 352 (approx 8' of fill over top of pipe).
Field review found no evidence of erosion or sedimentation in the vicinity of the inlet.
Headwater is contained within the 348' contour (based on LIDAR). At headwater elevations above El 348 flow will bypass to the east and flow to the next culvert crossing. No public or private infrastructure evident below El 348.

Outlet conditions:
Top of headwall elevation approx 336.0 (about 8' above invert).
Top of roadway embankment is about El 346 (approx 11' of fill over top of pipe)
Field review found no evidence of erosion or sedimentation in the vicinity of the outlet.
Downstream channel width varies from 3' to 5', with ann average slope of 2.5%.
The channel extends about 400' along the base of a steep roadway embankment to another 84" metal culvert crossing under NH 106. This segment of channel is all within State ROW.

Design Flow:
Streamstats Q50 = 76.7 cfs, based on the 0.68 sq mi drainage area. The area is just under the minimum limit of 0.7 sq mi, so confidence interval is not provided. Adjusting the discharge for the additional area (5% increase) yields an estimate Q50 of about 80 cfs.
An alternate regression method (FHWA Report RD-77-159) predicts the Q50 between 122 cfs and 187 cfs
The SCS Method (TR-55) predicts a Q50 of 150 cfs, based on 6.21" of rain in a 24 hour period.
Design flows will be based on the SCS Method, Q50 = 150 cfs

Hydraulic capacity:
Hydraulic analysis is from FHWA's HY-8 culvert analysis program.
Q50 Headwater elevation is 341.39 (about 4.5' Depth over invert, HW/D = 0.64) (Inlet Control)
Q50 outlet velocity 11.7 ft/s
Hydraulic capacity just prior to bypass flow (El 348.0) is 495 cfs (about 11' depth, HW/D = 1.57) (Inlet Control)

New Hampshire DOT
Department of Transportation

PROJECT	Concord-Pembroke		
PROJECT NO.	41267	ROUTE	I-393
CALCULATED BY	CAC	DATE	5/22/2018
CHECKED BY	JJN	DATE	5/23/2018
SUBJECT	Stream Crossings	SHEET	2 OF 2

Location 1

I-393 Sta 1207+50 **Cemetery Brook** Wetland ID# CS1, Class R2UB1 **Tier 2 Stream Crossing**

Proposed Design: **Drainage Area** Same as exisitng

The proposed treatment is rehabilitation by lining the deteriorated portion of the culvert with reinforced concrete.
The lining will be about 3" thick and extend up to just above the existing rust line, about 18" above the invert.
Culvert inverts will be raised approx 3". Roughness will be similar to brushed concrete (mannings n = 0.015)
Stone fill will be placed within the limits of the upstream headwall, to make a smooth transition from existing stream bed to the new pipe invert and to protect the headwall from scour.
The downstream channel will be lined with stone fill to dissipate energy and reduce velocity and will make a smooth transition from new outlet invert to existing stream bed.

Design Flow:
No change to Design Flow as a result of the project. **Q50 = 150 cfs**

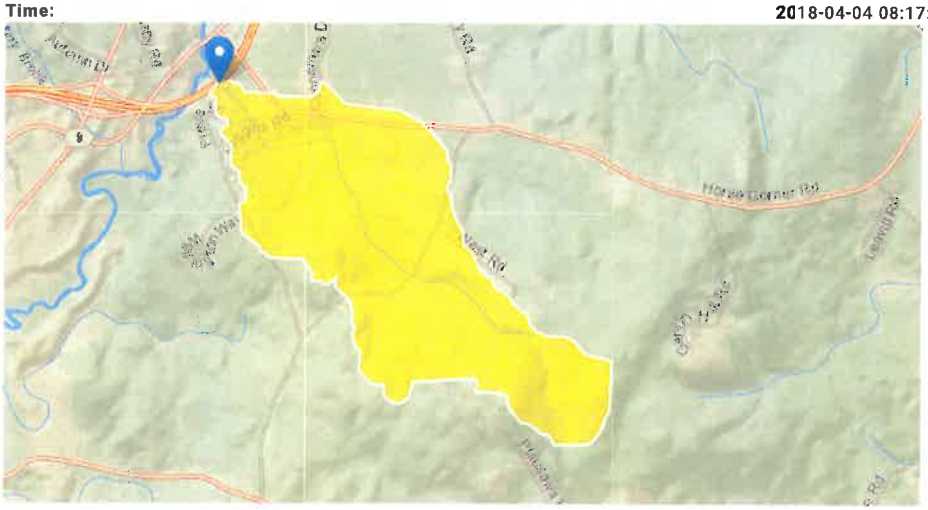
Hydraulic capacity:
Hydraulic analysis is from FHWA's HY-8 culvert analysis program.
Culverts with variable cross section and roughness cannot be modelled directly with HY-8.
The following results are for an 81" diameter culvert, invert 3" higher, and roughness n = 0.015
Q50 Headwater elevation is 341.72 (about 4.5' Depth over invert, HW/D = 0.67) (Inlet Control)
Q50 outlet velocity 16.5 ft/s
The above results are conservative, since the lining will only extend to about 20% of the pipe's height.
At high flows, capacity is expected to be slightly higher and outlet velocity slightly lower than the model results.
At the Design Flow, headwater increase (about 4") will not be significant and the increased outlet velocity will be mitigated by the proposed stone lining.

Alternatives:

The culvert has performed well for 30 years, with no reports of flooding or damage, and analysis indicates the crossing has adequate capacity.
Replacement would involve significantly more costs and impacts to I-393 due to the fill height and more wetland impacts for access and water diversion.
Replacement in-kind or with a larger structure are not considered to be practicable alternatives.
Other rehabilitation methods such as sliplining and sprayed on lining were considered, but were determined to be more expensive and/or would result in less capacity or higher outlet velocity than the proposed treatment.

Concord-Pembroke 41267 Unnamed Stream (TWIN 54" CMPs)

Region ID: NH
Workspace ID: NH20180404121729922000
Clicked Point (Latitude, Longitude): 43.23584, -71.46130
Time: 2018-04-04 08:17:44 -0400



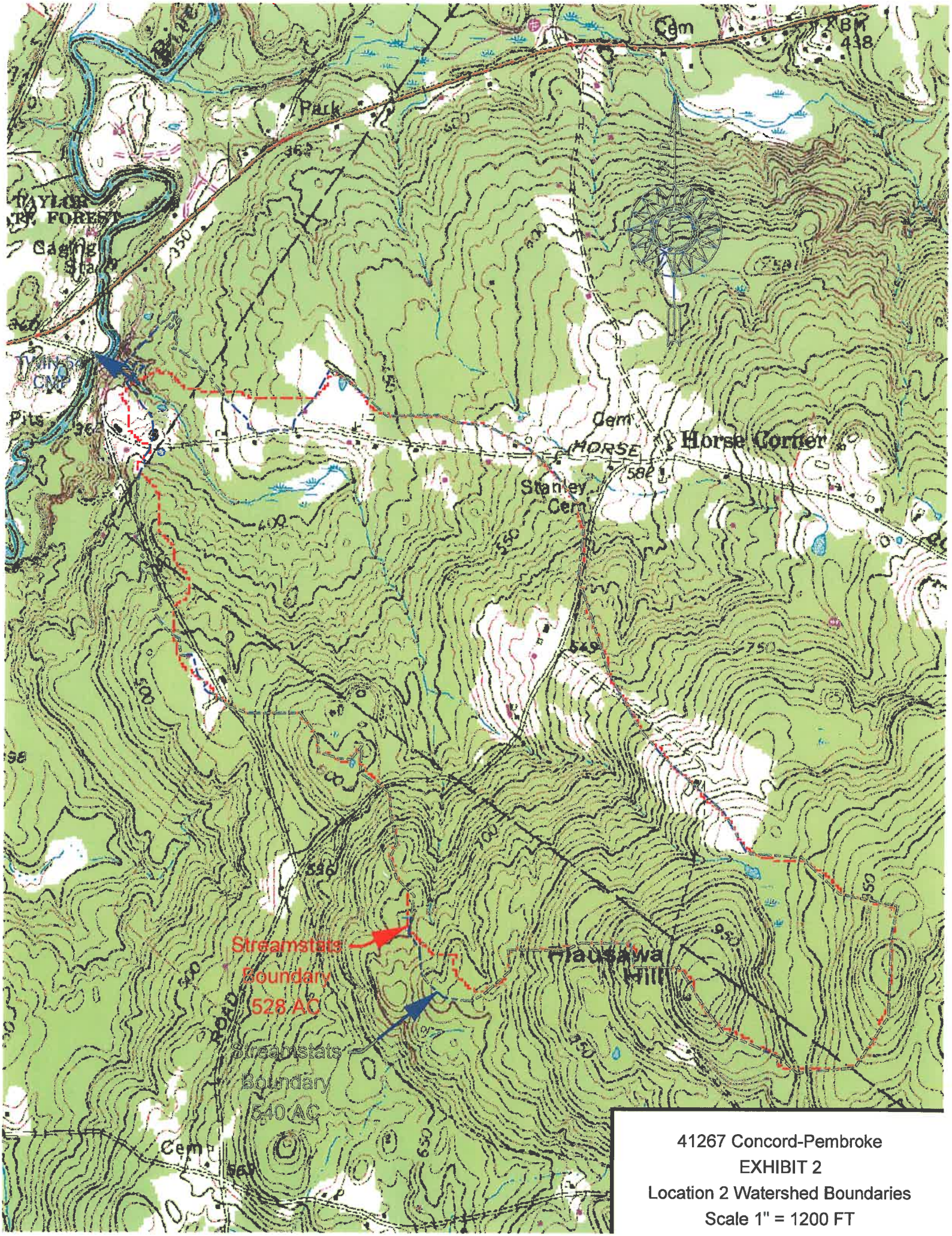
0.83 square miles = 531.2 acres = Tier 2 Stream Crossing

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.83	square miles
CONIF	Percentage of land surface covered by coniferous forest	17.3196	percent
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	6.73	inches
BSLDEM30M	Mean basin slope computed from 30 m DEM	10.431	percent
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest	29.7951	percent
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	7.9	inches
TEMP	Mean Annual Temperature	44.96	degrees F
TEMP_06_10	Basinwide average temperature for June to October summer period	61.323	degrees F
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	16.5	inches
ELEVMAX	Maximum basin elevation	1012.06	feet

Seasonal Flow Statistics Parameters [Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.83	square miles	3.26	689
CONIF	Percent Coniferous Forest	17.3196	percent	3.07	56.2
PREBC0103	Jan to Mar Basin Centroid Precip	6.73	inches	5.79	15.1
BSLDEM30M	Mean Basin Slope from 30m DEM	10.431	percent	3.19	38.1
MIXFOR	Percent Mixed Forest	29.7951	percent	6.21	46.1
PREG_03_05	Mar to May Gage Precipitation	7.9	inches	6.83	11.5
TEMP	Mean Annual Temperature	44.96	degrees F	36	48.7
TEMP_06_10	Jun to Oct Mean Basinwide Temp	61.323	degrees F	52.9	64.4
PREG_06_10	Jun to Oct Gage Precipitation	16.5	inches	16.5	23.1
ELEVMAX	Maximum Basin Elevation	1012.06	feet	260	6290



41267 Concord-Pembroke
EXHIBIT 2
Location 2 Watershed Boundaries
Scale 1" = 1200 FT

NH Department of Transportation
Bureau of Highway Design
Env-Wt 904.06 Repair or Rehabilitation of Tier 1 or Tier 2 Existing Legal Crossings

41267 Concord-Pembroke Location 2 Existing Twin 54" CMP's

See attached Stream Crossing Summary information

- In order to qualify under this section, the crossing cannot have a history of causing or contributing to flooding that damages the crossing or other infrastructure. Does the crossing have a history of flooding?
  No, this culvert crossing (Twin 54" CMP's) has no history of flooding

- Repair or rehabilitation pursuant to this section may be accomplished by concrete repair, slip lining, cured-in-place lining, or concrete invert lining. Please describe how this applies to the subject project.
  The culvert will be rehabilitated by lining the invert with reinforced concrete.

If the above criteria do not apply to this project, the crossing does not qualify under this section and must be designed according to 904.02 (Tier 1 crossings) or 904.05 (Tier 2 crossings).

If the above criteria apply to this project, please provide the following information.

The project may qualify as a **minimum** impact project if:
The crossing does not diminish the hydraulic capacity of the crossing.
The proposed rehabilitation will not have a significant effect on capacity.

The crossing does not diminish the capacity of the crossing to accommodate aquatic life passage.
Existing stone lining at the inlet will be graded to meet the culvert's new inverts. Existing stone lining at the outlet will be reset to create a permanent pool with elevation equal to the culverts' new inverts. The proposed rehabilitation will correct the existing perched condition at the outlet.

The crossing meets the general design criteria specified in Env-Wt 904.01, as follows:

Env-Wt 904.01
(a) Not be a barrier to sediment transport;
The proposed rehabilitation will not impact the culvert's ability to transport sediment.

(b) Prevent the restriction of high flows and maintain existing low flows;
The proposed rehabilitation will not significantly change high flow or low flow conditions.

(c) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;
The proposed rehabilitation will not obstruct or otherwise disrupt the movement of aquatic life beyond the actual duration of construction.

(d) Not cause an increase in the frequency of flooding or overtopping of banks;
The proposed rehabilitation will not have a significant effect on capacity. The Design Flow (Q50) is contained within the banks in existing and proposed conditions. Headwater elevation at the Design Flow does not impact any public or private infrastructure.

(e) Preserve watercourse connectivity where it currently exists;
Existing stone lining at the inlet will be graded to meet the culverts' new inverts, maintaining the existing connectivity.

(f) Restore watercourse connectivity where: (1) Connectivity previously was disrupted as a result of human activity(ies); and(2) Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;

The proposed rehabilitation will restore connectivity at the outlet by resetting existing stone to create a permanent pool with elevation equal to the culverts' new inverts.

(g) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and

The proposed rehabilitation will not cause erosion, aggradation, or scouring. The existing stone lining at the inlet and outlet is sufficient to prevent erosion and scouring.

(h) Not cause water quality degradation.

The proposed rehabilitation will not have a permanent effect on water quality. Erosion control best management practices will be used to prevent degradation to water quality during construction.

If the project does not qualify as a minimum impact project due to reasons stated above, it may qualify as a **minor** impact project if:

The crossing does not adversely impact the stability of the stream banks or stream bed upstream or downstream of the crossing.

The proposed rehabilitation will not adversely impact the stability of the stream banks or stream bed upstream or downstream of the crossing. The existing stone lining at the inlet and outlet is sufficient to maintain the stability of the stream bed and banks.

The crossing does not cause an increase in the frequency of flooding or overtopping of banks.

The proposed rehabilitation will not have a significant effect on capacity. The Design Flow (Q50) is contained within the banks in existing and proposed conditions. Headwater elevation at the Design Flow does not impact any public or private infrastructure.

If the project does not meet the above criteria for minimum OR minor, the crossing does not qualify under this section and must be designed according to 904.02 (Tier 1 crossings) or 904.05 (Tier 2 crossings).

New Hampshire DOT
Department of Transportation

PROJECT	Concord-Pembroke		
PROJECT NO.	41267	ROUTE	I-393
CALCULATED BY	CAC	DATE	5/22/2018
CHECKED BY	JJN	DATE	5/23/2018
SUBJECT	Stream Crossings	SHEET	1 OF 2

Location 2

I-393 Sta 1238+50 **Un-named stream** Wetland ID# PS1, Class R2UB1 **Tier 2 Stream Crossing**

Existing Conditions: **Drainage Area** 0.68 sq miles (435 acres) from Streamstats
0.71 sq miles (455 acres) from field review See Exhibit 2

Existing Pipes Twin 54" Corrugated Metal
Length (ft) 275
Slope 10.6%
Upstream Inv 328.65
Downstream Inv 299.4
Manning's n - 0.024

General:
The existing pipes were constructed by Project 10253, Plans dated 1986.
No changes or repairs observed or documented.
No reports of flooding or damage to roadway or private property related to this crossing.
Review of the record plans indicated a portion of I-393 median and roadsides are connected to the north 54" pipe via a 24" cmp, located approximately 100' upstream of the culvert outlet . This adds about 8 acres to the drainage area. Review of the Streamstats boundary vs LIDAR data from GRANIT (UNH's GIS Database) and field review resulted in changes to the boundary in several locations, primarily due to roadway drainage and residential development, adding another 4 acres of total area.
LIDAR elevations compared favorably with NHDOT ground Survey performed for this project.
Elevations are from NHDOT Survey unless otherwise noted.

Inlet Conditions:
Top of headwall elevation approx 334.6 (about 6' above invert).
Top of roadway embankment is about El 339.0 (approx 8' of fill over top of pipe).
Field review found no evidence of erosion or sedimentation in the vicinity of the inlet.
Headwater is contained within the 336' contour, which extends upstream about 110' (all within State ROW). At headwater elevations above El 336, flow will bypass to the south along the roadside ditch and flow into the Soucook Rver.

Outlet conditions:
Top of headwall elevation approx 305.6 (about 6.2' above invert).
Top of roadway embankment is about El 332 (approx 16' of fill over top of pipe)
Field review found no evidence of erosion or sedimentation in the vicinity of the outlet.
The entire outlet area is stone lined with large cobbles and boulders. A pool extends about 40' from the outlet.
The pipe inverts were perched about 6" above the pool elevation with a trickle of flow coming from both culverts.
Downstream channel extends about 60' from the end of the pool to the Soucook River. Average slope 7%.
The channel is lined with cobbles and large boulders. No evidence of sedimentation or erosion.

Design Flow:
Streamstats Q50 = 127 cfs, based on the 0.82 sq mi drainage area, with a range of 70 cfs to 334 cfs.
Adjusting the discharge for the additional area (2% increase) yields an estimate Q50 of about 130 cfs.
An alternate regression method (FHWA Report RD-77-159) predicts the Q50 between 244 cfs and 288 cfs
The SCS Method (TR-55) predicts a Q50 of 260 cfs, based on 6.21" of rain in a 24 hour period.
Design flows will be based on the SCS Method, Q50 = 260 cfs

Hydraulic capacity:
Hydraulic analysis is from FHWA's HY-8 culvert analysis program.
Q50 Headwater elevation is 334.11 (about 5.4' Depth over invert, HW/D = 1.20) (Inlet Control)
Q50 outlet velocity 20.3 ft/s
Hydraulic capacity just prior to bypass flow (El 336.0) is 344 cfs (about 7.3' depth, HW/D = 1.62) (Inlet Control)

New Hampshire DOT
Department of Transportation

PROJECT	Concord-Pembroke		
PROJECT NO.	41267	ROUTE	I-393
CALCULATED BY	CAC	DATE	5/23/2018
CHECKED BY	JJN	DATE	5/23/2018
SUBJECT	Stream Crossings	SHEET	2 OF 2

Location 2

I-393 Sta 1238+50 **Un-named stream** Wetland ID# PS1, Class R2UB1 **Tier 2 Stream Crossing**

Proposed Design: **Drainage Area** Same as exisitng

The proposed treatment is rehabilitation by lining the deteriorated portion of the culvert with reinforced concrete.
The lining will be about 3" thick and extend up to just above the existing rust line, about 18" above the invert.
Culvert inverts will be raised approx 3". Roughness will be similar to brushed concrete (mannings n = 0.015)
On the upstream side, existing stone fill will be reset to make a smooth transition from existing stream bed to the new pipe invert and to protect the headwall from scour.
On the downstream side, existing stone fill will be reset to replicate the intent of the original design, which was a permanent pool with elevation equal to the culvert outlet inverts. This will eliminate the perched condition.

Design Flow:
No change to Design Flow as a result of the project. **Q50 = 260 cfs**

Hydraulic capacity:
Hydraulic analysis is from FHWA's HY-8 culvert analysis program.
Culverts with variable cross section and roughness cannot be modelled directly with HY-8.
The following results are for twin 51" diameter culverts with similar roughness (n = 0.015)
Q50 Headwater elevation is 334.85 (about 5.9' Depth over invert, HW/D = 1.39) (Inlet Control)
Q50 outlet velocity 28.7 ft/s
The above results are conservative, since the lining will only extend to about 33% of the pipe's height.
At high flows, capacity is expected to be slightly higher and outlet velocity slightly lower than the model results.
At the Design Flow, headwater increase (about 9") will not be significant and the outlet velocity will be reduced significantly by the permanent pool and existing stone lining.

Alternatives:

The twin culverts have performed well for 30 years, with no reports of flooding or damage, and analysis indicates the crossing has adequate capacity.
Replacement would involve significantly more costs and impacts to I-393 due to the fill height and more wetland impacts for access and water diversion.
Replacement in-kind or with a larger structure are not considered to be practicable alternatives.
Other rehabilitation methods such as sliplining and sprayed on lining were considered, but were determined to be more expensive and/or would result in less capacity or higher outlet velocity than the proposed treatment.

Memo

NH Natural Heritage Bureau
NHB Datacheck Results Letter

To: Melilotus Dube, New Hampshire Department of Transportation
7 Hazen Drive
Concord, NH 03301

From: Amy Lamb, NH Natural Heritage Bureau
Date: 7/24/2017 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB17-2267 Town: Concord, Pembroke Location: culvert crossings under I393 on the west side of Exit 3 in Concord and at MM 3.9 in Pembroke

Description: NHDOT Concord-Pembroke 41267.
cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: This site is within an area flagged for possible impacts on the state-listed *Alasmidonta varicosa* (brook floater) in the Soucook River. Please contact NH Fish & Game to address wildlife concerns.

Invertebrate Species	**State[1]**	**Federal**	**Notes**
Brook Floater (*Alasmidonta varicosa*)	E	--	Contact the NH Fish & Game Dept (see below).

Vertebrate species	**State[1]**	**Federal**	**Notes**
Wood Turtle (*Glyptemys insculpta*)	SC	--	Contact the NH Fish & Game Dept (see below).

[1]Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

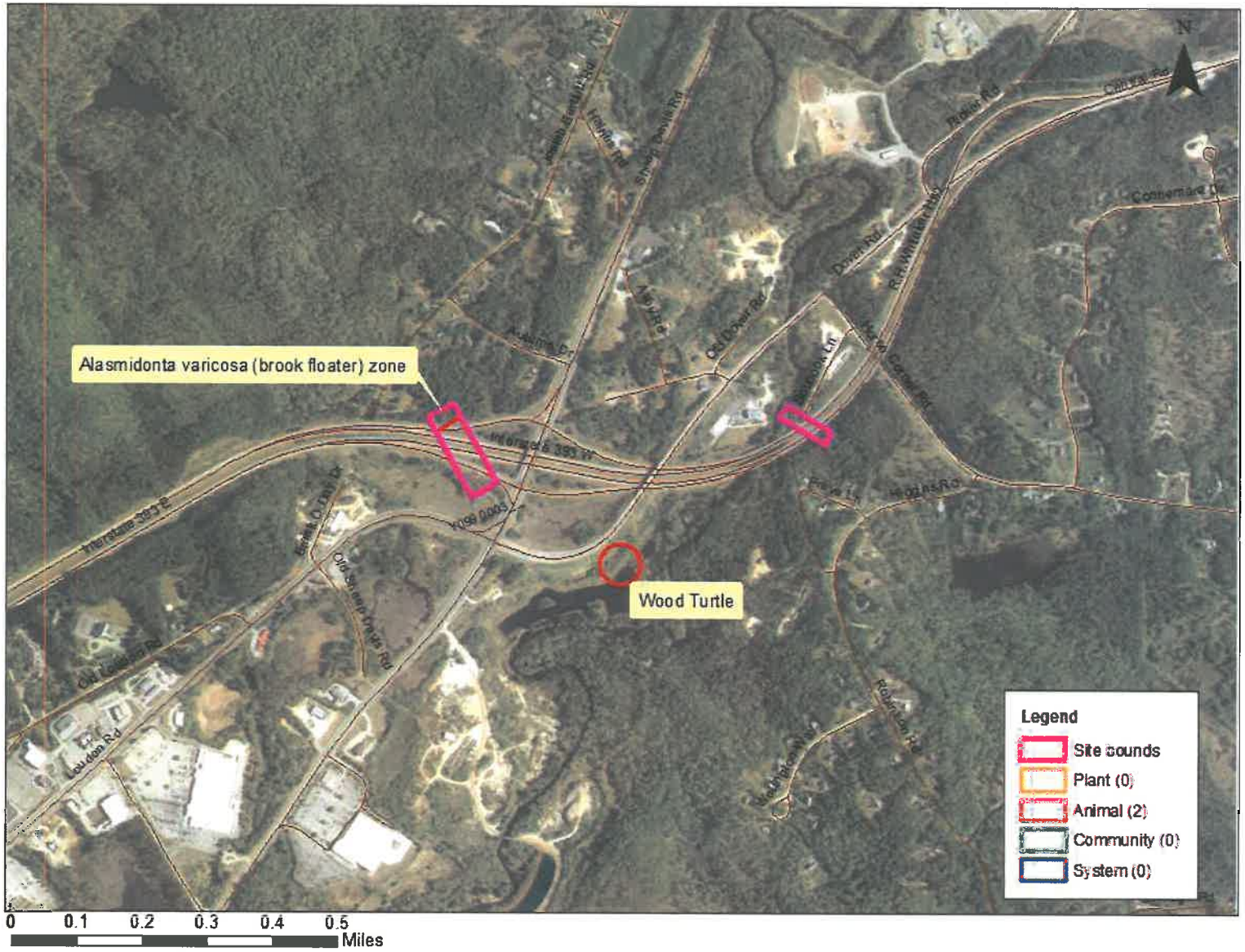
Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Department of Resources and Economic Development
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DRED/NHB
172 Pembroke Rd.
Concord, NH 03301

NHB17-2267


Alasmidonta varicosa (brook floater) zone
Wood Turtle
Legend
Site bounds
Plant (0)
Animal (2)
Community (0)
System (0)
0 0.1 0.2 0.3 0.4 0.5
Miles

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Rare or uncommon
State:	Special Concern	State:	Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2010: Area 12825: 1 adult observed.
General Area: 2010: Area 12825: Steep riverbank.
General Comments:
Management Comments:

Location

Survey Site Name: Soucook River WMA, Ladd Tract
Managed By: Ladd Tract

County: Merrimack
Town(s): Concord
Size: 1.9 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2010: Area 12825: Ladd Tract of Soucook River WMA.

Dates documented

First reported: 2010-04-26 Last reported: 2010-04-26

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

Dube, Melilotus

From: Dube, Melilotus
Sent: Friday, April 06, 2018 11:48 AM
To: Large, Sarah
Subject: FW: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

From: Magee, John
Sent: Friday, April 06, 2018 10:52 AM
To: Dube, Melilotus; Carucci, Christopher
Cc: Tuttle, Kim
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

Thanks Meli and Chris for providing that detail. That sounds fine to me.

John

John Magee
M.S., Certified Fisheries Professional
Fish Habitat Biologist
New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301
P 603-271-2744
F 603-271-5829

"NH Fish and Game Department: Connecting you to life outdoors"

Did you know...The NH Fish and Game Department protects, conserves and manages more than 500 species of wildlife, including 63 mammals, 18 reptiles, 22 amphibians, 313 birds, and 122 fish. For more information visit: http://wildlife.state.nh.us/Wildlife/wildlife_plan.htm

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From: Dube, Melilotus
Sent: Thursday, April 05, 2018 11:19 AM
To: Magee, John
Cc: Carucci, Christopher
Subject: FW: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

John,
Sorry for playing middle man. Does Chris's response below sound reasonable?
Meli

From: Carucci, Christopher
Sent: Wednesday, April 04, 2018 12:45 PM
To: Dube, Melilotus
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

There should not be a need to create a pool at the 84" outlet.
The top surface of the stone would match the new concrete invert and stream bed at about 2% slope, with no vertical obstruction.
It would look very similar to the existing condition after some natural sediment fills in the voids in the stone (photo from Aug 2017 attached).

From: Dube, Melilotus
Sent: Wednesday, April 04, 2018 12:31 PM
To: Carucci, Christopher
Subject: FW: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

Chris,
Please see John's response.
Meli

From: Magee, John
Sent: Wednesday, April 04, 2018 12:30 PM
To: Dube, Melilotus
Cc: Tuttle, Kim
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

At the 84" pipe, the stone apron could itself block fish and turtles...can grade control to get the pool elevation to match the invert elevation and an apron be used? If grade control can be used, I recommend its elevation be the same as the invert to ensure that the pool backwaters the invert at all flows (especially low flows).

John Magee
M.S., Certified Fisheries Professional
Fish Habitat Biologist
New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301
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From: Dube, Melilotus
Sent: Wednesday, April 04, 2018 11:16 AM
To: Magee, John
Cc: Tuttle, Kim
Subject: FW: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

John,

Please see Chris Carucci's proposed treatment of the twin 54" culvert perch below. I believe the intent is to return the pipe to the original as-built condition, which would eliminate the perch. Chris also has a suggestion for the outlet of the single 84" culvert, which is not currently perched. We are working on wetland impact plans now, which will include impacts for this work. Will this address your concerns or are there further measures that we should incorporate?

Kim,
My understanding is that correcting the perched condition will alleviate your concerns for turtle, etc, passage as well?

I just want to make sure we include the appropriate treatment and close the loop with you both!
Meli

From: Carucci, Christopher
Sent: Wednesday, April 04, 2018 10:01 AM
To: Dube, Melilotus
Cc: Fifield, Samantha
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

At the outlet of the twin 54" culverts, I suggest resetting the existing rock to the original design (1986), as shown on the attached plan,
modified slightly so that the pool elevation matches the new concrete invert elevation.

For the 84" culvert outlet, we can add a small stone apron to make a smooth transition from the new concrete invert to the existing stream channel. There is no existing perch at the outlet and channel is on mild slope.

From: Dube, Melilotus
Sent: Wednesday, March 28, 2018 9:14 AM
To: Carucci, Christopher
Cc: Fifield, Samantha
Subject: FW: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

Chris,
Please see John Magee's response below regarding the perch at the twin 54" pipes.
Meli

From: Magee, John
Sent: Wednesday, March 14, 2018 2:39 PM
To: Tuttle, Kim; Dube, Melilotus
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

Yes, grade control (rocks of sufficient size) downstream of the outlets could be used to eliminate the perched condition. Depending on the slope just downstream, it could require two grade control structures.

John

John Magee
M.S., Certified Fisheries Professional
Fish Habitat Biologist
New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301
P 603-271-2744
F 603-271-5829

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From: Tuttle, Kim
Sent: Wednesday, March 14, 2018 1:04 PM
To: Dube, Melilotus
Cc: Magee, John
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns NHB17-2267

Hi Meli,

The placement of 4"-6" of reinforced concrete on the bottom of the pipes at least up to the rust line in order to stabilize the deteriorated bottom will likely provide passage opportunities for fish and wildlife including wood turtle in most conditions as long as the inlets and outlets are not perched. John Magee will likely have some input on the treatment of the existing perch at the outlet of the twin 54" pipes. We also recommend wildlife friendly erosion control matting without welded plastic or biodegradable plastic netting or thread for this project.

Thanks,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

From: Dube, Melilotus
Sent: Wednesday, March 14, 2018 12:52 PM
To: Tuttle, Kim
Cc: Magee, John
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns

Kim,
Design has provided some clarification on the proposed treatment. The current recommendation is to install a concrete invert lining instead of sliplining. This would involve placing 4"-6" of reinforced concrete on the bottom of the pipes at least up to the rust line in order to stabilize the deteriorated bottom of the pipes which have rusted out. The only existing perch is at the outlet of the twin 54" pipes, which could be corrected with rocks to create stepped pools. What are you initial thoughts on this approach instead of slip-lining?
Meli

From: Dube, Melilotus
Sent: Wednesday, March 14, 2018 12:11 PM
To: Tuttle, Kim

Cc: Magee, John
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns

Kim,
I have not been to the site yet to take photos so I am attaching the best I could find from the Design Team's site visit. I can send you more once I take some.
I don't believe we consider replacement for these kinds of pipes due disproportionate increase in cost and impacts to natural resources and traffic for these kinds of pipes, but I will check in with the design team about other potential options.
Thanks,
Meli

From: Tuttle, Kim
Sent: Wednesday, March 14, 2018 11:58 AM
To: Dube, Melilotus
Cc: Magee, John
Subject: RE: NHDOT Concord-Pembroke 41267 NHFG Concerns

Hello Meli,

I sent this to John Magee also. I can tell you that we won't recommend a smooth slip lining of these culverts as it would preclude wildlife and fish passage. Are there alternatives that can be considered to accommodate wildlife passage? Also, could you provide a few photos of the inlets and outlet to each so that we can see what kind of perch may exist?

Thank you,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

From: Dube, Melilotus
Sent: Wednesday, March 14, 2018 11:51 AM
To: Tuttle, Kim
Subject: NHDOT Concord-Pembroke 41267 NHFG Concerns

Good morning Kim,

I am reviewing the subject project which involves culvert rehabilitation at two locations along Interstate 393 in Concord and Pembroke. The first location is a 84" by 600' long corrugated metal pipe carries Cemetery Brook under I393 just west of the NH Route 106 overpass at Exit 3 (MM3.35) in Concord and the second location includes twin 54" by 500' long corrugated metal pipes carrying an unnamed stream under I393 east of the Soucook River (MM3.95) in Pembroke. The proposed work will include slip-lining the culverts which cross under the highway and repairing or replacing the headwalls as necessary.

NHNHB noted that there are known records for brook floater and wood turtle in the vicinity of the project area, please see attached NHB17-2267 report.

Please review and let me know if there are any anticipated impacts to these species.

Thank you!
Meli

Melilotus M. Dube
Environmental Manager
NHDOT Bureau of Environment
7 Hazen Drive
Concord, NH 03301
(603) 271-1612
NEW EMAIL: Melilotus.Dube@dot.nh.gov

From: Lamb, Amy
Sent: Monday, July 24, 2017 4:34 PM
To: Dube, Melilotus
Cc: Tuttle, Kim
Subject: NHB review: NHB17-2267

Attached, please find the review we have completed. If your review memo includes potential impacts to plants or natural communities please contact me for further information. If your project had potential impacts to wildlife, please contact NH Fish and Game at the phone number listed on the review.

Best,
Amy

Amy Lamb
Ecological Information Specialist

NH Natural Heritage Bureau
DRED - Forest & Lands
172 Pembroke Rd
Concord, NH 03301
603-271-2215 ext. 323

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To:
Consultation Code: 05E1NE00-2017-SLI-2245
Event Code: 05E1NE00-2018-E-03359
Project Name: Concord-Pembroke 41267

April 04, 2018

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2017-SLI-2245

Event Code: 05E1NE00-2018-E-03359

Project Name: Concord-Pembroke 41267

Project Type: TRANSPORTATION

Project Description: Slipline or otherwise rehabilitate, including headwall repair or reconstruction, two culverts carrying unnamed streams under Interstate 393 in Concord and Pembroke. The Concord crossing is a 392 linear foot 84" CMP under the west side of Exit 3, the Pembroke crossing is a 275 linear foot twin 54" CMP at Mile Marker 3.9.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/43.23515073204738N71.47238249770754W

Counties: Merrimack, NH

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

IPaC Record Locator: 224-11882758 April 04, 2018

Subject: Consistency letter for the 'Concord-Pembroke 41267' project (TAILS 05E1NE00-2017-R-2245) under the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated to verify that the **Concord-Pembroke 41267** (Proposed Action) may rely on the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures, and may affect, and is likely to adversely affect the endangered Indiana bat (*Myotis sodalis*) and/or the threatened Northern long-eared bat (*Myotis septentrionalis*). Consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) is required.

This "may affect - likely to adversely affect" determination becomes effective when the lead Federal action agency or designated non-federal representative uses it to ask the Service to rely on the PBO to satisfy the agency's consultation requirements for this project. Please provide this consistency letter to the lead Federal action agency or its designated non-federal representative with a request for its review, and as the agency deems appropriate, transmittal to this Service Office for verification that the project is consistent with the PBO.

This Service Office will respond by letter to the requesting Federal action agency or designated non-federal representative within 30 calendar days to:

- verify that the Proposed Action is consistent with the scope of actions covered under the PBO;
- verify that all applicable avoidance, minimization, and compensation measures are included in the action proposal;
- identify any action-specific monitoring and reporting requirements, consistent with the monitoring and reporting requirements of the PBO, and
- identify anticipated incidental take.

ESA Section 7 compliance for this Proposed Action is not complete until the Federal action agency or its designated non-federal representative receives a verification letter from the Service.

For Proposed Actions that include bridge/structure removal, replacement, and/or maintenance activities: If your initial bridge/structure assessments failed to detect Indiana bats, but you later detect bats during construction, please submit the Post Assessment Discovery of Bats at Bridge/Structure Form (User Guide Appendix E) to this Service Office. In these instances, potential incidental take of Indiana bats may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species and/or designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please advise the lead Federal action agency for the Proposed Action accordingly.

Project Description

The following project name and description was collected in IPaC as part of the endangered species review process.

Name

Concord-Pembroke 41267

Description

Slipline or otherwise rehabilitate, including headwall repair or reconstruction, two culverts carrying unnamed streams under Interstate 393 in Concord and Pembroke. The Concord crossing is a 84" CMP under I393 located just west of Exit 3, the Pembroke crossing includes twin 54" CMPs under I393 at Mile Marker 3.9.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

April 25, 2018

Melilotus M. Dube
Bureau of Environment
NH Department of Transportation
7 Hazen Drive
P.O. Box 483
Concord, New Hampshire 03302-0483

Re: Concord-Pembroke, X-004(575), 41267
TAILS: 05E1NE00-2017-F-2245

Dear Ms. Dube:

The U.S. Fish and Wildlife Service (Service) is responding to your request, dated April 4, 2018, to verify that the Concord to Pembroke, X-004(575), 41267 Project (Project) in New Hampshire may rely on the December 15, 2016, Programmatic Biological Opinion (BO) for federally funded or approved transportation projects that may affect the northern long-eared bat (*Myotis septentrionalis*) (NLEB). We received your request and the associated LAA Consistency Letter on April 9, 2018. This letter provides the Service's response as to whether the Federal Highway Administration may rely on the BO to comply with section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) for the Project's effects to the NLEB.

The New Hampshire Department of Transportation (NHDOT), as the non-Federal agency representative for the Federal Transportation Agency, has determined that the Project may affect, and is likely to adversely affect the NLEB. The Project consists of the repair and rehabilitation of three culverts under Interstate 393 in Concord and Pembroke. Approximately 0.25 acre of tree clearing will occur during the bat active season.

NHDOT also determined the Project may rely on the programmatic BO to comply with section 7(a)(2) of the ESA, because the Project meets the conditions outlined in the BO and all tree clearing related to the proposed work will occur farther than 0.25 mile from documented roosts and farther than 0.5 mile from any known hibernacula. The Service reviewed the LAA Consistency Letter and concurs with NHDOT's determination. This concurrence concludes your ESA section 7 responsibilities relative to this species for this Project, subject to the Reinitiation Notice below.

Conclusion

The Service has reviewed the effects of the proposed Project, which include the NHDOT's commitment to implement the impact avoidance, minimization, and compensation measures as indicated on the LAA Consistency Letter. We confirm that the proposed Project's effects are consistent with those analyzed in the BO. The Service has determined that the Project is consistent with the BO's conservation measures, and the scope of the program analyzed in the BO is not likely to jeopardize the continued existence of the NLEB. In coordination with your agency, the Federal Highway Administration, and the other sponsoring Federal Transportation Agencies, the Service will reevaluate this conclusion annually in light of any new pertinent information under the adaptive management provisions of the BO.

Incidental Take of the Northern Long-eared Bat

The Service anticipates that tree removal associated with the proposed Project will cause incidental take of the NLEB. However, the Project is consistent with the BO, and such projects will not cause take of NLEBs that is prohibited under the final 4(d) rule for this species (50 CFR §17.40(o)). Therefore, this taking does not require exemption from the Service.

Reporting Dead or Injured Bats

The NHDOT, the Federal Highway Administration, its State/local cooperators, and any contractors must take care when handling dead or injured NLEBs that are found at the project site, in order to preserve biological material in the best possible condition and to protect the handler from exposure to diseases, such as rabies. Project personnel are responsible for ensuring that any evidence about determining the cause of death or injury is not unnecessarily disturbed. Reporting the discovery of dead or injured listed species is required in all cases to enable the Service to determine whether the level of incidental take exempted by this BO is exceeded, and to ensure that the terms and conditions are appropriate and effective. Parties finding a dead, injured, or sick specimen of any endangered or threatened species must promptly notify the Service's New England Field Office.

Reinitiation Notice

This letter concludes consultation for the proposed Project, which qualifies for inclusion in the BO issued to the Federal Transportation Agencies. To maintain this inclusion, a reinitiation of this project-level consultation is required where the Federal Highway Administration's discretionary involvement or control over the Project has been retained (or is authorized by law) and if:

1. new information reveals that the Project may affect listed species or critical habitat in a manner or to an extent not considered in the BO;
2. the Project is subsequently modified in a manner that causes an effect to listed species or designated critical habitat not considered in the BO; or
3. a new species is listed or critical habitat designated that the Project may affect.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

We appreciate your continued efforts to ensure that this Project is fully consistent with all applicable provisions of the BO. If you have any questions regarding our response, or if you need additional information, please contact Susi von Oettingen of this office at 603-227-6418.

Sincerely yours,

Thomas R. Chapman
Supervisor
New England Field Office

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Projects with Minimal Potential to Cause Effects

Date Reviewed:	4/23/2018		
Project Name:	Concord-Pembroke		
State Number:	41267	**FHWA Number:**	X-A004(575)
Environmental Contact:	Meli Dube	**DOT**	
Email Address:	Melilotus.Dube@dot.nh.gov	**Project Manager:**	Tobey Reynolds

Project Description: Project involves culvert rehabilitation at two locations along Interstate 393 in Concord and Pembroke. The proposed work associated with existing deteriorated culverts involves installation of a concrete invert liner, and repair or replacement of the headwalls as appropriate. The first location involves a single 84" corrugated metal pipe (CMP) carrying Cemetery Brook under I393 just west of the NH Route 106 overpass at Exit 3 (MM3.35) in Concord. The second location involves twin 54" CMPs carrying an unnamed stream under I393 east of the Soucook River (MM3.95) in Pembroke.

Please select the applicable undertaking type(s):

☐	1. Modernization and general highway maintenance **that may require additional highway right-of-way or easement**, and which is **not within the boundaries of a historic property or district,** including:
	Choose an item. Choose an item.
☒	2. Non-historic bridge and culvert maintenance, renovation, or total replacement, **that may require minor additional right-of-way or easement**, and which is **not within the boundaries of a historic property or district**, including:
	a. replacement of maintenance of drainage pipes and culverts made of steel, plastic and concrete Choose an item.
☐	3. Historic bridge maintenance activities within the limits of existing right-of-way, including:
	Choose an item. Choose an item.
☐	4. Stream stabilization and restoration activities (including removal of debris or sediment obstructing the natural waterway, or any non-invasive action to restore natural conditions).
☐	5. Construction of bicycle lanes and pedestrian walkways, sidewalks, shared-use paths and facilities, small passenger shelters, and alterations to facilities or vehicles in order to make them accessible for elderly and handicapped persons, **not within the boundaries of a historic property or district**.
☐	6. Installation of bicycle racks, **not within the boundaries of a historic property or district**.
☐	7. Recreational trail construction, **not within the boundaries of a historic property or district**.
☐	8. Recreational trail maintenance when done on existing alignment.
☐	9. Modernization, maintenance, and safety improvements of railroad facilities within the existing railroad or highway right-of-way, **not within the boundaries of a historic property or district, and no historic railroad features are impacted,** including, but not limited to:
	Choose an item. Choose an item.
☐	10. Acquisition or renewal of scenic, conservation, habitat, or other land preservation easements
☐	11. Installation of Intelligent Transportation Systems.

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Projects with Minimal Potential to Cause Effects

Please describe how this project is applicable under Appendix B of the Programmatic Agreement.

This project can proceed under the Programmatic Agreement, Appendix B as the culverts do not lie within a historic district and they were constructed in association with the realignment of I-393 in 1987 (1986 Plans of Proposed Federal Aid Project I-393-2(119)42 Project Pembroke-Chichester 10253).

NHDOT in-house projects: Please append photographs, USGS maps, design plans and as-built plans, if available, for review.

LPA projects: Please submit this Certification Form along with the Transportation RPR

Coordination Efforts:

Has an RPR been submitted to NHDOT for this project?	No	NHDHR R&C # assigned?	Click here to enter text.
Please identify public outreach effort contacts; method of outreach and date:	On March 15, 2018;, letters were issued to the Concord City Planner, Heritage Commission, Conservation Commission and City Manager; as well as the Pembroke Conservation Commission, Planning Board Historical Society and Board of Selectmen. No concerns with the proposed project have been identified by Town Officials.		

Finding: (To be filled out by NHDOT Cultural Resources Staff)

☐	**No Potential to Cause Effects**	☒	**No Historic Properties Affected**
This finding serves as the Section 106 Memorandum for your environmental documents, no further coordination is necessary.			
☐	**This project does *not* comply with Appendix B, and will continue under the Section 106 review process outlined in 36 CFR 800.3-800.7. Please contact NHDOT Cultural Resources Staff to determine next steps.**		

NHDOT comments: **Avoid accessing the culvert through areas that will disturb historic stone walls and archaeological resources noted on Concord-Pembroke 41267 I-393 Culvert Rehab Location 2 of 2; preliminary plans 6/22/2017. If necessary, erect snow fencing as needed to ensure avoidance.**

Sheila Charles 4/23/2018

NHDOT Cultural Resources Staff Date

Coordination of the Section 106 process should begin as early as possible in the planning phase of the project (undertaking) so as not to cause a delay.

Project sponsors should not predetermine a Section 106 finding under the assumption that an undertaking conforms to the types listed in Appendix B until this form is signed by the NHDOT Bureau of Environment Cultural Resources Program staff.

Every project shall be coordinated with, and reviewed by the NHDOT-BOE Cultural Resources Program in accordance with the Cultural Resources Programmatic Agreement among the Advisory Council on Historic Preservation, Federal Highway Administration, NH Department of Transportation, and the State Historic Preservation Office. In accordance with the Advisory Council's regulations, we will continue to consult, as appropriate, as this project proceeds.

Appendix B Certification – Projects with Minimal Potential to Cause Effects

If any portion of the undertaking is not entirely limited to any one or a combination of the types specified in Appendix B (with, or without a portion that is included as a type listed in Appendix A), please continue discussions with NHDOT Cultural Resources staff.

This No Potential to Cause Effect or No Historic Properties Affected project determination is your Section 106 finding, as defined in the Programmatic Agreement.

Should project plans change, please inform the NHDOT Cultural Resources staff in accordance with Stipulation VII of the Programmatic Agreement.

US Army Corps of Engineers
New England District

U.S. Army Corps of Engineers
New Hampshire Programmatic General Permit (PGP)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to "work" include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See PGP, GC 5 regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*		X
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, shellfish beds, special wetlands and vernal pools (see PGP, GC 26 and Appendix A)? Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) website, www.nhnaturalheritage.org, specifically the book Natural Community Systems of New Hampshire.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	X	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)		X
2.5 The overall project site is more than 40 acres.		X
2.6 What is the size of the existing impervious surface area?	N/A	
2.7 What is the size of the proposed impervious surface area?	N/A	
2.8 What is the % of the impervious area (new and existing) to the overall project site?	N/A	
3. Wildlife	Yes	No
3.1 Has the NHB determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require a NHB determination.)	X	
3.2 Would work occur in any area identified as either "Highest Ranked Habitat in N.H." or "Highest Ranked Habitat in Ecological Region"? (These areas are colored magenta and green, respectively, on NH Fish and Game's map, "2010 Highest Ranked Wildlife Habitat by Ecological Condition.") Map information can be found at: • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm. • Data Mapper: www.granit.unh.edu. • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html.		X
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		X
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		X
3.5 Are stream crossings designed in accordance with the PGP, GC 21?	X	

4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	X	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?	N/A	N/A
5. Historic/Archaeological Resources		
If a minor or major impact project, has a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) been sent to the NH Division of Historical Resources as required on Page 5 of the PGP?**		X

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.
** If project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

Figure 1. Impact Location A: Looking north at the upstream channel and banks of Cemetery Brook from the inlet of the 84" single CMP, photo taken by the NHDOT Bureau of Highway Design on 8/11/17.

Figure 2. Impact Locations A and B: Looking south at the inlet and pipe deterioration of the 84" single CMP carrying Cemetery Brook under I393 from the upstream channel, photo taken by the NHDOT Bureau of Highway Design on 6/9/17.

Figure 3. Impact Locations B and C: Looking north at the outlet and pipe deterioration of the 84" single CMP carrying Cemetery Brook under I393 from the downstream channel, photo taken by the NHDOT Bureau of Highway Design on 8/11/17.

Figure 4. Impact Location C: Looking south at the downstream channel and banks of Cemetery Brook from the outlet of the 84" single CMP, photo taken by the NHDOT Bureau of Highway Design on 8/11/17.

Figure 5. Impact Location D: Looking southeast at the upstream channel and banks, including the existing stone, of the unnamed stream from the inlet of the 54" twin CMPs, photo taken by the NHDOT Bureau of Highway Design on 8/11/17.

Figure 6. Impact Locations D, E1 and E2: Looking northwest at the inlet and pipe deterioration of the 54" twin CMPs carrying the unnamed stream under I393 from the upstream channel, photo taken by the NHDOT Bureau of Highway Design on 6/9/17.

Figure 7. Impact Locations E1, E2 and F: Looking southeast at the outlet, pipe deterioration and existing perch of the 54" twin CMPs carrying the unnamed stream under I393 from the downstream bank, photo taken by the NHDOT Bureau of Highway Design on 6/9/17.

Figure 8. Impact Location F: Looking northwest at the downstream channel and banks, including the existing pool, of the unnamed stream from the outlet of the 54" twin CMPs, photo taken by the NHDOT Bureau of Highway Design on 6/9/17.

Concord-Pembroke 41267– Construction Sequence

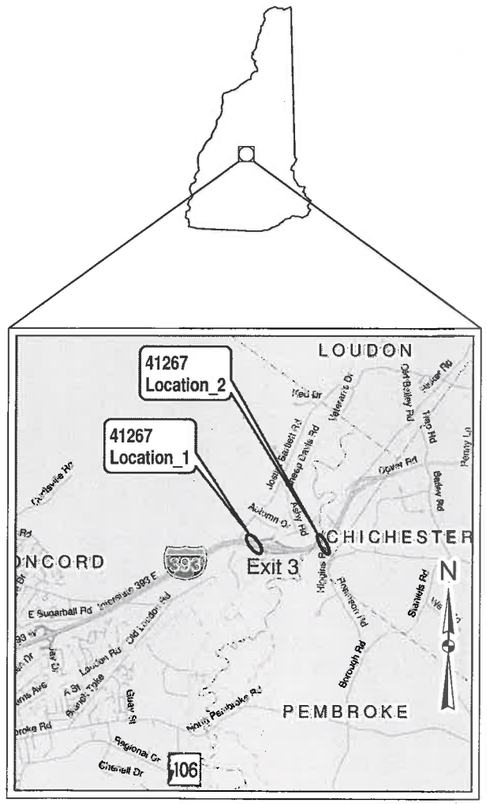
The 84" and the twin 54" corrugated metal pipe culverts will be rehabilitated in the same manner described below:

1. Clear trees and brush as needed for access
2. Install erosion control measures
3. Install water diversion structure. Clean water bypass shall be through the existing pipe(s) unless otherwise approved as part of the Contractor's Erosion Control Plan.
4. Clean and inspect culverts
5. Construct the reinforced concrete invert liner
6. Place new stone lining or reset existing stone lining
7. Remove the water diversion structures
8. Seed and mulch disturbed areas
9. Remove the erosion control measures

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

WETLAND IMPACT PLANS
FEDERAL AID PROJECT

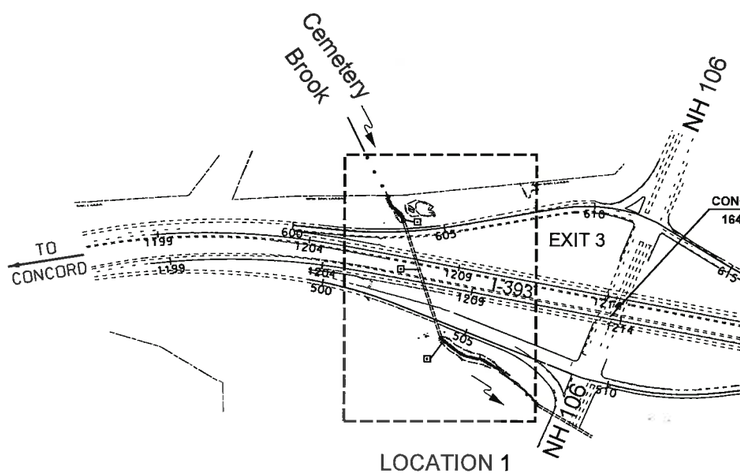
X-004(575)
N.H. PROJECT NO. 41267
INTERSTATE - 393
CULVERT REHABILITATION



1 ½ 0 1 2 mi.

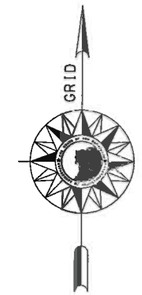
GRAPHIC SCALE

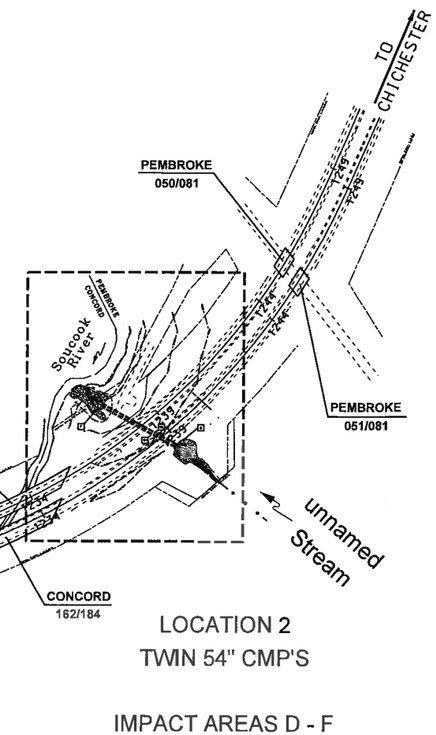
LOCATION MAP



LOCATION 1
84" CMP

IMPACT AREAS A - C
SEE SHEET NO. 4





LOCATION 2
TWIN 54" CMP'S

IMPACT AREAS D - F
SEE SHEET NO. 5

INDEX OF SHEETS

DATE: 5/24/2018

CITY OF CONCORD - TOWN OF PEMBROKE

COUNTY OF MERRIMACK

SCALE: 1" = 250'

Wetland Delineation by:
FB Environmental/
Christopher Dorion
Nov. 2017

NHDOT THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

INTERSTATE 393
CULVERT REHABILITATION
WETLAND IMPACT PLANS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHE
41267FSW	41267	1	10

DRAINAGE

MANHOLE

CATCH BASIN

DROP INLET

(existing) (PROPOSED)

DRAINAGE PIPE (existing) (label size & type)

DRAINAGE PIPE (PROPOSED)

UNDERDRAIN (existing) W/ FLUSHING BASIN

UNDERDRAIN (PROPOSED) W/ FLUSHING BASIN

show direction of flow (label size & type)

HEADER (existing & PROPOSED) (with stone outlet protection)

END SECTION (existing & PROPOSED) METAL or PLASTIC / RCP

OPEN DITCH (PROPOSED)

EROSION CONTROL / STONE SLOPE PROTECTION

BOUNDARIES / RIGHT-OF-WAY

RIGHT-OF-WAY LINE (label type)

RR RIGHT-OF-WAY LINE

PROPERTY LINE

PROPERTY LINE (COMMON OWNER)

TOWN LINE BOW / CONCORD

COUNTY LINE COOS / GRAFTON

STATE LINE MAINE / NEW HAMPSHIRE

NATIONAL FOREST

CONSERVATION LAND

BENCH MARK / SURVEY DISK

BOUND (PROPOSED)

STATE LINE/ TOWN LINE MONUMENT S/L T/L

NHDOT PROJECT MARKER

IRON PIPE OR PIN

DRILL HOLE IN ROCK

TAX MAP AND LOT NUMBER 156 14 / 1642/341 / 6.80 Ac.±

PROPERTY PARCEL NUMBER 12

HISTORIC PROPERTY

UTILITIES

	existing	PROPOSED
TELEPHONE POLE		
POWER POLE		
JOINT OCCUPANCY		
MISCELLANEOUS/UNKNOWN POLE		
GUY POLE OR PUSH BRACE		
LIGHT POLE		
LIGHT ON POWER POLE		
LIGHT ON JOINT POLE		

(plot point at face not center of symbol)

POLE STATUS: REMOVE, LEAVE, PROPOSED, OR TEMPORARY AS APPLICABLE e.g.: R L P+04 25.0' T+04 25.0'

RAILROAD (label ownership)

RAILROAD SIGN

RAILROAD SIGNAL

UTILITY JUNCTION BOX jb JB

OVERHEAD WIRE OW OW (label type) OW OW

UNDERGROUND UTILITIES

WATER (on existing lines label size, type and note if abandoned) W W PW PW

SEWER S S PS PS

TELEPHONE T T PT PT

ELECTRIC E E PE PE

GAS G G PG PG

LIGHTING L L PL PL

INTELLIGENT TRANSPORTATION SYSTEM ITS ITS PITS PITS

FIBER OPTIC FO FO PFO PFO

WATER SHUT OFF

GAS SHUT OFF

HYDRANT

MANHOLES

SEWER MHS

TELEPHONE MHT

ELECTRICAL MHE

GAS MHG

UNKNOWN

TRAFFIC SIGNALS / ITS

	existing	PROPOSED
MAST ARM (existing)		30' MA (NOTE ANGLE FROM Ø)
OPTICOM RECEIVER		
OPTICOM STROBE		
TRAFFIC SIGNAL		
PEDESTAL WITH PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON UNIT		
SIGNAL CONDUIT	-C-C-C-	-PC-PC-PC-
CONTROLLER CABINET	cc	CC
METER PEDESTAL	mp	MP
PULL BOX	pb	PB
LOOP DETECTOR (QUADRUPOLE)		(label size)
LOOP DETECTOR (RECTANGULAR)		(label size)
CAMERA POLE (CCTV)		
FIBER OPTIC DELINEATOR	fod	FOD
FIBER OPTIC SPLICE VAULT		SVF
ITS EQUIPMENT CABINET	its	ITS
VARIABLE SPEED LIMIT SIGN		
DYNAMIC MESSAGE SIGN		
ROAD AND WEATHER INFO SYSTEM		

CONSTRUCTION NOTES

CURB MARK NUMBER - BITUMINOUS	B-1
CURB MARK NUMBER - GRANITE	G-1
CLEARING AND GRUBBING AREA	A
DRAINAGE NOTE	1
EROSION CONTROL NOTE	A
FENCING NOTE	A
GUARDRAIL NOTE	1
ITS NOTE	1
LIGHTING NOTE	A
TRAFFIC SIGNAL NOTE	1

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
9-1-2016	41267stdsymb1_2	41267	2	10

GENERAL

EDGE OF PAVEMENT
TRAVELED WAY
PROPOSED ROADWAY
existing roadway
(pavement removed outside slope lines)

DRIVEWAYS
(label surface type)

BUILDINGS
(building to be removed)
(label house or type of building)

FOUNDATION
(label type)

LEACH FIELD
leach field

BRIDGE CROSSINGS
STREAM
OVERPASS

STEPS AND WALK
(label type)

INTERMITTENT WATER COURSE

SHORE LINE
river/stream
pond
(label name of water body)

POTENTIAL WET AREA SYMBOL

BRUSH OR WOODS LINE

TREES (PLANS)
(deciduous) (coniferous) (stump)
(show station, circumference in feet & type)

TREE OR STUMP (CROSS-SECTIONS)

HEDGE
(label type)

MONITORING WELL
mon

WELL

FLAG POLE
fp

ORIGINAL GROUND (TYPICALS)

ROCK OUTCROP

ROCK LINE (TYPICALS & SECTIONS ONLY)

GUARDRAIL (label type)
existing
PROPOSED
bgr
cgr

JERSEY BARRIER

CURB (LABEL TYPE)

STONE WALL

RETAINING WALL (LABEL TYPE)
(points toward retained ground)

FENCE (LABEL TYPE)
(single post)
(double post)

SIGNS

GAS PUMP
gp

FUEL TANK (ABOVE GROUND)
ft (label size & type)

STORAGE TANK FILLER CAP
fc

SEPTIC TANK

GRAVE
gr

MAILBOX
mb

VENT PIPE
vp

SATELLITE DISH ANTENNA
da

PHONE
ph

GROUND LIGHT/LAMP POST
gl lp

BORING LOCATION
B

TEST PIT
TP

INTERSTATE NUMBERED HIGHWAY
293

UNITED STATES NUMBERED HIGHWAY
3

STATE NUMBERED HIGHWAY
102

SHORELAND - WETLAND

WETLAND DESIGNATION AND TYPE
2
PUB2E

DELINEATED WETLAND — DW —
ORDINARY HIGH WATER — OHW —
TOP OF BANK — TOB —
TOP OF BANK & ORDINARY HIGH WATER — TOBOHW —
NORMAL HIGH WATER — NHW —
WIDTH AT BANK FULL — WBF —
PRIME WETLAND — PWET —
PRIME WETLAND 100' BUFFER — PWET100 —
NON-JURISDICTIONAL DRAINAGE AREA — NJDA —
COWARDIN DISTINCTION LINE — CDL —
TIDAL BUFFER ZONE — TBZ —
DEVELOPED TIDAL BUFFER ZONE — DTBZ —
HIGHEST OBSERVABLE TIDE LINE — HOTL —
MEAN HIGH WATER — MHW —
MEAN LOW WATER — MLW —
VERNAL POOL — VP —
SPECIAL AQUATIC SITE — SAS —
REFERENCE LINE — REF —
WATER FRONT BUFFER — WB50 —
NATURAL WOODLAND BUFFER — NWB150 —
PROTECTED SHORELAND — PS250 —
INVASIVE SPECIES LABEL
I.S. I
I.S. II
INVASIVE SPECIES — INV —

FLOODPLAIN / FLOODWAY

500 YEAR FLOODPLAIN BOUNDARY — FP500 —
100 YEAR FLOODPLAIN BOUNDARY — FP100 —
FLOODWAY — FW —

ENGINEERING

CONSTRUCTION BASELINE
30 31 32
PC. PT. POT (ON CONST BASELINE)
PI (IN CONSTRUCTION BASELINES)
INTERSECTION OR EQUATION OF TWO LINES
ORIGINAL GROUND LINE (PROFILES AND CROSS-SECTIONS)
PROFILE GRADE LINE (PROFILES AND CROSS-SECTIONS)

SLOPE LINE
CLEARING LINE

CLEARING LINE
SLOPE LINE
SLOPE LINE (FILL)
SLOPE LINE (CUT)

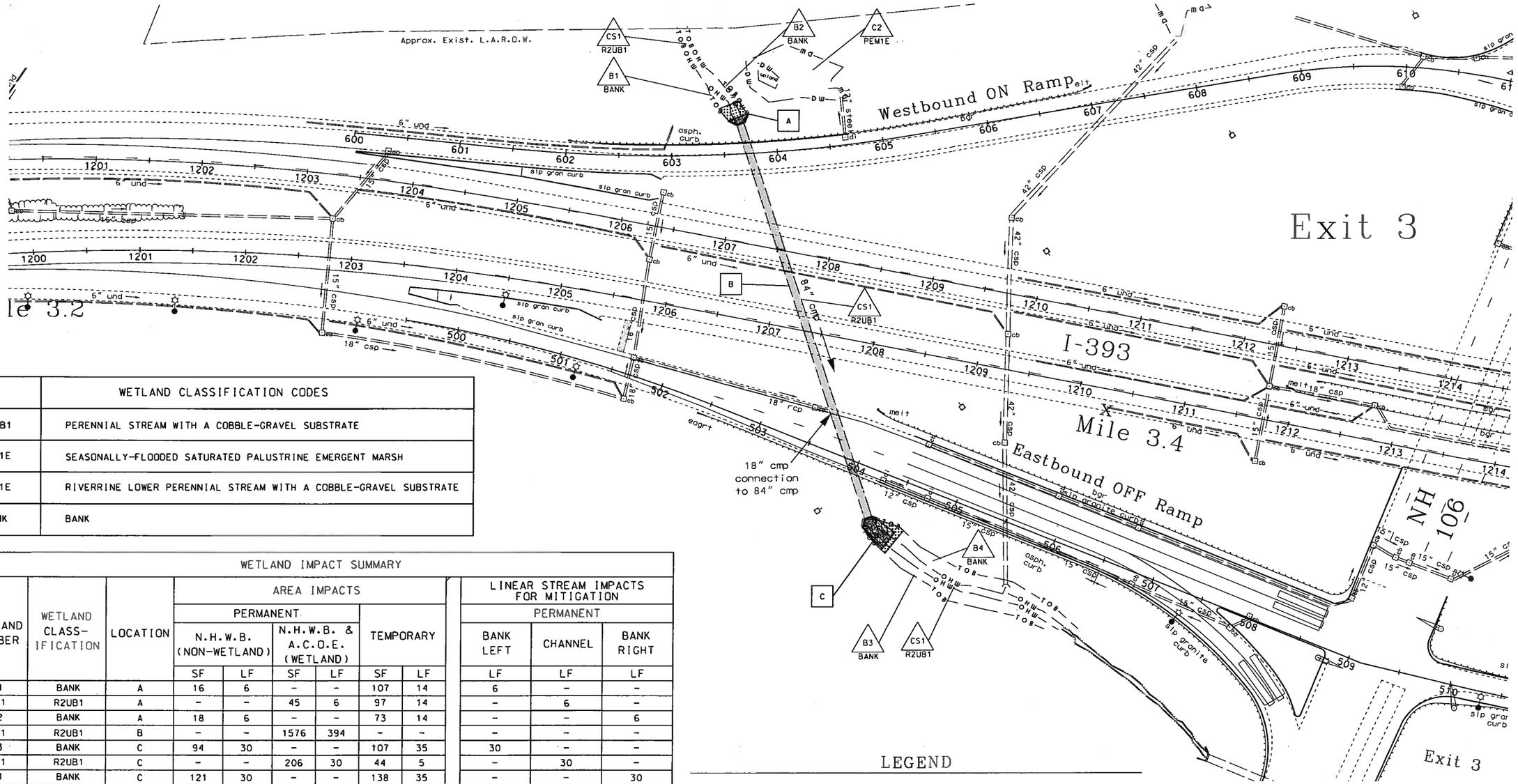
PROFILES AND CROSS SECTIONS:
ORIGINAL GROUND ELEVATION (LEFT) 72.5
FINISHED GRADE ELEVATION (RIGHT) 79.14

SHEET 1 OF 2

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
11-21-2014	41267stdsymb1_2	41267	3	10



	WETLAND CLASSIFICATION CODES
R2UB1	PERENNIAL STREAM WITH A COBBLE-GRAVEL SUBSTRATE
PEM1E	SEASONALLY-FLOODED SATURATED PALUSTRINE EMERGENT MARSH
PFO1E	RIVERRINE LOWER PERENNIAL STREAM WITH A COBBLE-GRAVEL SUBSTRATE
BANK	BANK

WETLAND IMPACT SUMMARY

WETLAND NUMBER	WETLAND CLASS-IFICATION	LOCATION	AREA IMPACTS						LINEAR STREAM IMPACTS FOR MITIGATION		
			PERMANENT				TEMPORARY		PERMANENT		
			N.H.W.B. (NON-WETLAND)		N.H.W.B. & A.C.O.E. (WETLAND)				BANK LEFT	CHANNEL	BANK RIGHT
			SF	LF	SF	LF	SF	LF	LF	LF	LF
B1	BANK	A	16	6	–	–	107	14	6	–	–
CS1	R2UB1	A	–	–	45	6	97	14	–	6	–
B2	BANK	A	18	6	–	–	73	14	–	–	6
CS1	R2UB1	B	–	–	1576	394	–	–	–	–	–
B3	BANK	C	94	30	–	–	107	35	30	–	–
CS1	R2UB1	C	–	–	206	30	44	5	–	30	–
B4	BANK	C	121	30	–	–	138	35	–	–	30
		–	–	–	–	–	–	–	–	–	–
B5	BANK	D	–	–	–	–	103	20	–	–	–
PS1	R2UB1	D	–	–	–	–	484	20	–	–	–
B6	BANK	D	–	–	–	–	205	20	–	–	–
PS1	R2UB1	E1	–	–	825	275	–	–	–	–	–
PS1	R2UB1	E2	–	–	825	275	–	–	–	–	–
B7	BANK	F	–	–	–	–	1721	65	–	–	–
PS1	R2UB1	F	–	–	–	–	864	35	–	–	–
	TOTAL		249	72	3477	980	3943	277	36	36	36

PERMANENT IMPACTS: 3,726 SF
TEMPORARY IMPACTS: 3,943 SF

TOTAL IMPACTS: 7,669 SF

LEGEND

TYPE OF WETLAND IMPACT	SHADING/ HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

WETLAND DESIGNATION NUMBER

WETLAND IMPACT LOCATION

WETLAND MITIGATION AREA

MITIGATION

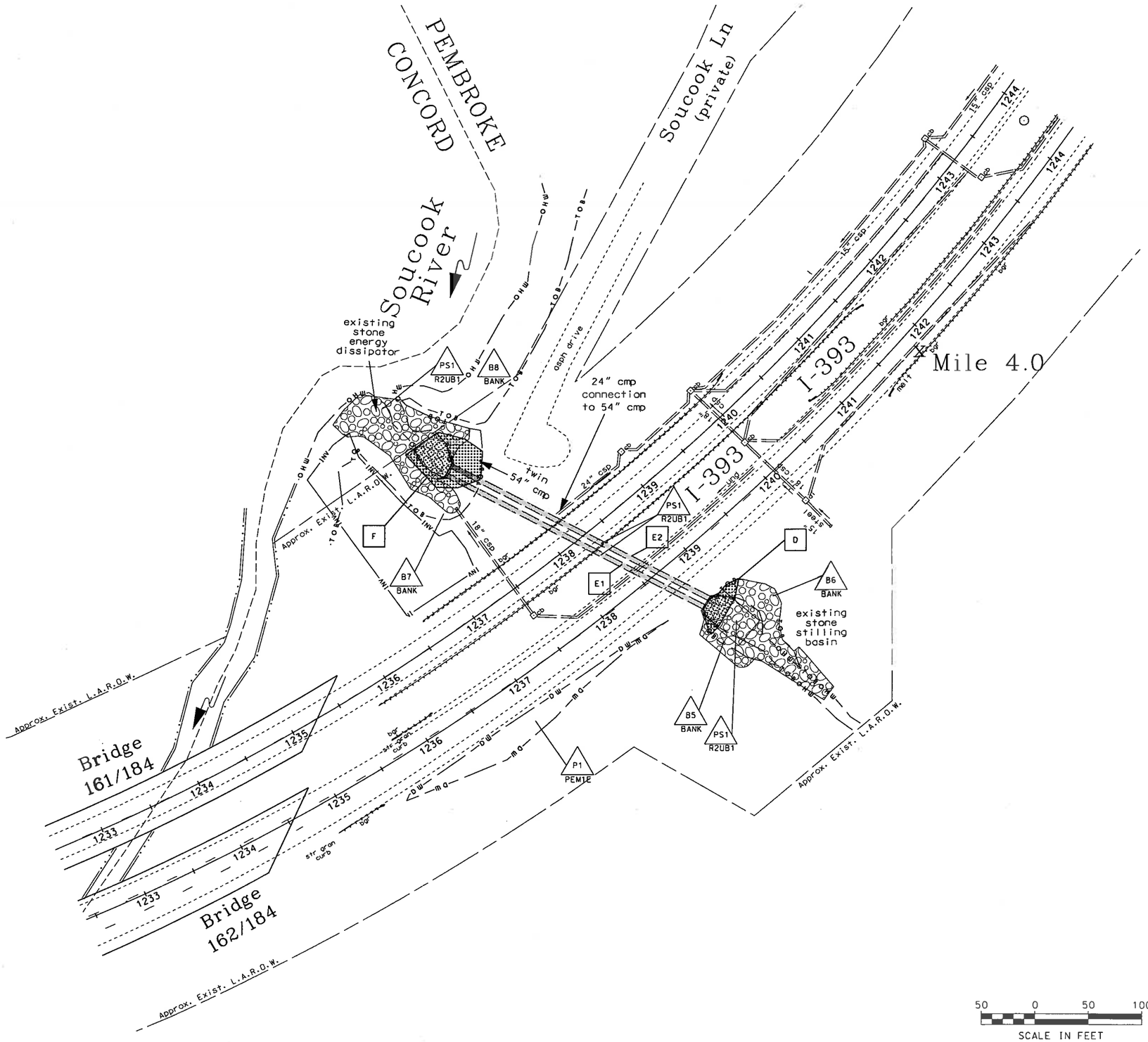
50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WETLAND IMPACT PLANS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
41267wetplans	41267	4	10

DESCRIPTION | STATION | STATION | DATE | NUMBER
NEW DESIGN SDF DATE APRIL 2018
SHEET CHECKED CAC DATE 5/2018
AS BUILT DETAILS DATE



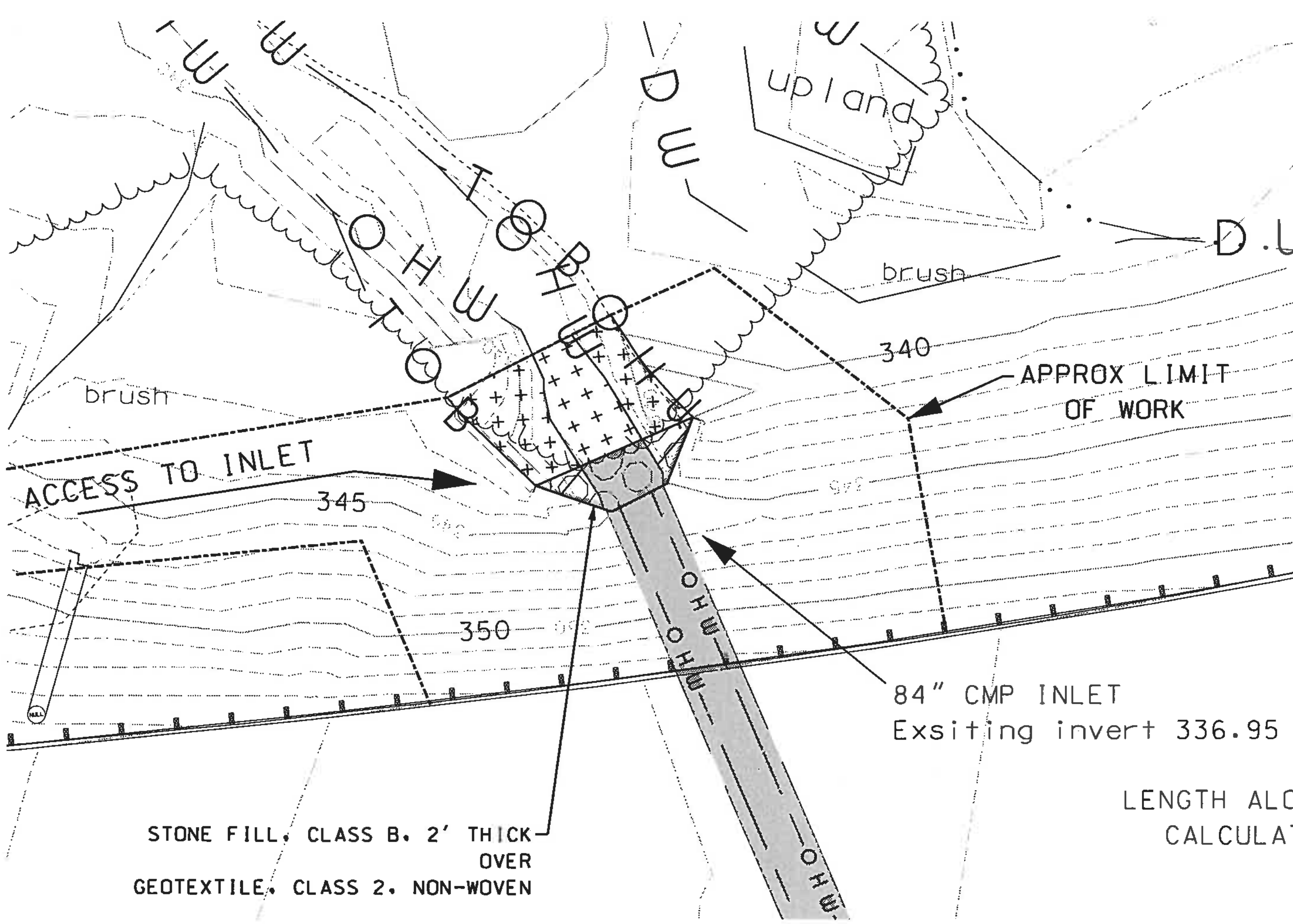
NUMBER	DATE	STATION	DESCRIPTION

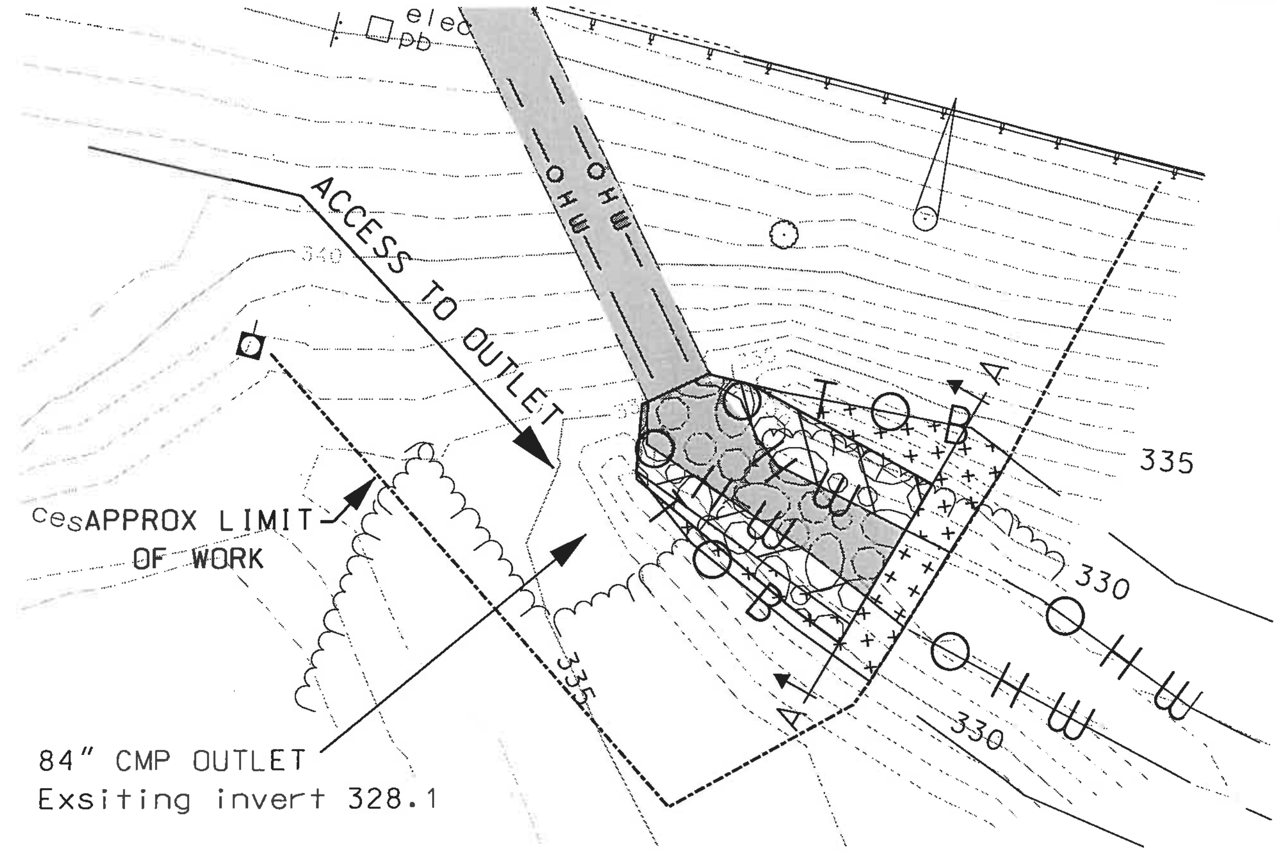
NEW DESIGN SDF DATE APRIL 2018
SHEET CHECKED CAC DATE 5/2018
AS BUILT DETAILS DATE

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WETLAND IMPACT PLANS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
41267wetplans	41267	5	10





LENGTH ALONG INVERT 394 LF
CALCULATED SLOPE 2.2%

PLACE STONE LINING ONLY WITHIN LIMITS OF EXISTING STONE HEADWALL. TOP OF STONE SHALL MAKE A SMOOTH TRANSITION FROM EXISTING STREAMBED TO THE NEW PIPE INVERT.

IMPACT AREA B
(INSIDE PIPE)

IMPACT AREA C
(OUTLET SIDE)

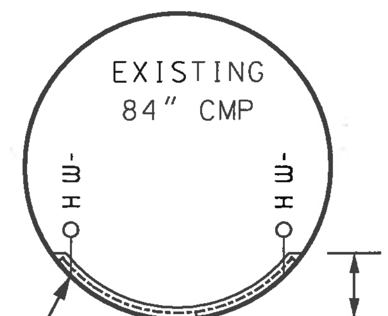
PLAN VIEW

10 0 10 20
SCALE IN FEET

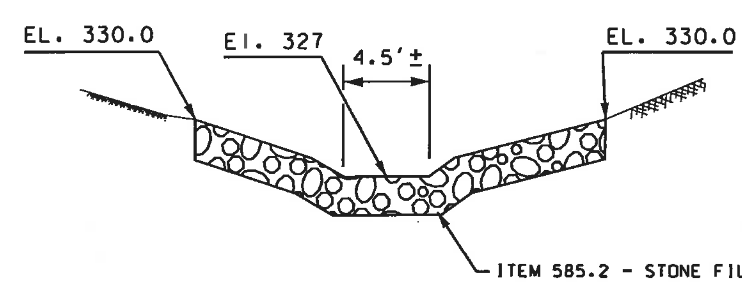
IMPACT AREA A
(INLET SIDE)

PLAN VIEW

10 0 10 20
SCALE IN FEET



TYPICAL
not to scale



SECTION AA
not to scale

STONE LINING TO 30' DOWNSTREAM OF PIPE OUTLET, AND TO ELEVATION 3' ABOVE CHANNEL BOTTOM

TOP OF STONE TO MATCH EXISTING GROUND AT SECTION A-A AND SHALL MATCH NEW PIPE INVERT AT OUTLET

LOCATION 1 - 84" CMP

DESCRIPTION | STATION | STATION | DATE | NUMBER

EW DESIGN SDF DATE APRIL 2018
HEET CHECKED CAC DATE 5/2018
S BUILT DETAILS DATE

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION o BUREAU OF HIGHWAY DESIGN

DETAILS
LOCATION 1

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS

SURVEY INVERTS
299.4 (SOUTH)
299.4 (NORTH)

SURVEY INVERTS
328.6 (SOUTH)
328.7 (NORTH)

SOUCOOK RIVER

Top of Berm
Elev. 303.6

24" CSP
Saddle Branch
See Detail Sht. 35

ACCESS TO OUTLET

Special Headwall
W.B. Sta. 137+32, Lt.
See Detail Sheet 35
& ACCESS RD.

24" CSP

Edge of I-393

℄ W.B. I393

℄ E.B. I393

Special Headwall See Detail Sht. 35
E.B. Sta. 139+07, Rt.

Stone Lined Stilling Basin

Stone Lined Channel

9+00

30' Transition

18'-0"

36'-0"

10+00

11+00

12+00 270'x 54" C.S.P.

270'x 54" C.S.P.

13+00

14+00

15+00

W.B. Sta. 137+10, Lt.

Apron, Elev. 300.0

Pool Elev. 296.4

121'x 18" C.S.P.

Proposed C.B.
W.B. Sta. 137+10

18" Stub E
Plug

IMPACT AREA F
(OUTLET AREA)

APPROX LIMIT
OF WORK

IMPACT AREA E1 & E2
(INSIDE PIPES)

APPROX LIMIT
OF WORK

PLAN
Scale: 1"=20'

IMPACT AREA D
(INLET AREA)

LENGTH ALONG INVERTS 275 LF
CALCULATED SLOPE 10.6%

3'-0" Stone Fill, Class 'A'
Item 585.1

6'-0" 9'-0" 6'-0"

Geotextile
Woven
Item 593.1

SECTION A-A
No Scale

Item 585.2 Stone
Fill Class B

Apron
Elev. 300.0

Top of Berm
Elev. 303.6

Common Fill

Limits of Item 206.1
Common Structure Excavation

SECTION B-B

50' Long x 30' Wide
Stone Lined Stilling Basin

100'-0"
Stone Lined Channel

End of Stilling Basin
Elev. 324.2

Pipe Inv.
328.7

Geotextile Woven
Item 593.1

3'-0" Stone Fill Class 'A'
Item 585.1

3'-0" Stone Fill Class 'A'
Item 585.1

Item 585.2 Stone Fill
Class B

Apron Elev. 300.0

Pool Elev. 296.4

Inv. Elev. 300.0

30' Transition

18'

36'

2-270'x 54" C.S.P. T= 0.138" (TWIN PIPES)
S= 10.630%

MRM Headwall
See Detail Sht. 35

Old Ground

MRM HEADWALL
SEE DETAIL SHT. 35

Edge of Soucook River

340
330
320
310
300

DATUM 290

RESET EXISTING STONE AT INLET
TO MATCH NEW PIPE INVERTS

RESET EXISTING STONE AT OUTLET
SO THAT POOL ELEVATION MATCHES
NEW PIPE INVERTS

Original construction plan from
Project 10253 shown for reference.
(not to scale)

EXISTING
54" CMP

HW

HW

OHW INSIDE PIPE
BASED ON EXISTING
RUST LINE
(APPROX 3' WIDE)

HEIGHT APPROX
18" ABOVE INVERT

REINFORCED CONCRETE
INVERT LINING, 3" THICK

TYPICAL
not to scale

LOCATION 2 - TWIN 54" CMP

DESCRIPTION | STATION | DATE | NUMBER

DESIGN SDF DATE APRIL 2018
CHECKED CAC DATE 5/2018
AS BUILT DETAILS DATE

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

DETAILS
LOCATION 2

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS

EROSION CONTROL STRATEGIES

1. ENVIRONMENTAL COMMITMENTS:
   1.1. THESE GUIDELINES DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ANY CONTRACT PROVISIONS, OR APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
   1.2. THIS PROJECT WILL BE SUBJECT TO THE US EPA'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER CONSTRUCTION GENERAL PERMIT AS ADMINISTERED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THIS PROJECT IS SUBJECT TO REQUIREMENTS IN THE MOST RECENT CONSTRUCTION GENERAL PERMIT (CGP).
   1.3. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE NHDES WETLAND PERMIT, THE US ARMY CORPS OF ENGINEERS PERMIT, WATER QUALITY CERTIFICATION AND THE SPECIAL ATTENTION ITEMS INCLUDED IN THE CONTRACT DOCUMENTS.
   1.4. ALL STORM WATER, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3, EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION (DECEMBER 2008) (BMP MANUAL) AVAILABLE FROM THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).
   1.5. THE CONTRACTOR SHALL COMPLY WITH RSA 485-A:17, AND ALL PUBLISHED NHDES ALTERATION OF TERRAIN ENV-WQ 1500 REQUIREMENTS (HTTP://DES.NH.GOV/ORGANIZATION/COMMISSIONER/LEGAL/RULES/INDEX.HTM)
   1.6. THE CONTRACTOR IS DIRECTED TO REVIEW AND COMPLY WITH SECTION 107.1 OF THE CONTRACT AS IT REFERS TO SPILLAGE, AND ALSO WITH REGARDS TO EROSION, POLLUTION, AND TURBIDITY PRECAUTIONS.

2. STANDARD EROSION CONTROL SEQUENCING APPLICABLE TO ALL CONSTRUCTION PROJECTS:
   2.1. PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH DISTURBING ACTIVITIES. PERIMETER CONTROLS AND STABILIZED CONSTRUCTION EXITS SHALL BE INSTALLED AS SHOWN IN THE BMP MANUAL AND AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARER.
   2.2. EROSION, SEDIMENTATION CONTROL MEASURES AND INFILTRATION BASINS SHALL BE CLEANED, REPLACED AND AUGMENTED AS NECESSARY TO PREVENT SEDIMENTATION BEYOND PROJECT LIMITS THROUGHOUT THE PROJECT DURATION.
   2.3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT AND SECTION 645 OF THE NHDOT SPECIFICATIONS FOR ROAD AND BRIDGES CONSTRUCTION.
   2.4. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
      (A) BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
      (B) A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
      (C) A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED;
      (D) TEMPORARY SLOPE STABILIZATION CONFORMING TO TABLE 1 HAS BEEN PROPERLY INSTALLED
   2.5. ALL STOCKPILES SHALL BE CONTAINED WITH A PERIMETER CONTROL. IF THE STOCKPILE IS TO REMAIN UNDISTURBED FOR MORE THAN 14 DAYS, MULCHING WILL BE REQUIRED.
   2.6. A WATER TRUCK SHALL BE AVAILABLE TO CONTROL EXCESSIVE DUST AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR.
   2.7. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL REMAIN UNTIL THE AREA HAS BEEN PERMANENTLY STABILIZED.
   2.8. CONSTRUCTION PERFORMED ANY TIME BETWEEN NOVEMBER 30" AND MAY 1" OF ANY YEAR SHALL BE CONSIDERED WINTER CONSTRUCTION AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.
      (A) ALL PROPOSED VEGETATED AREAS WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15", OR WHICH ARE DISTURBED AFTER OCTOBER 15", SHALL BE STABILIZED IN ACCORDANCE WITH TABLE 1.
      (B) ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15", OR WHICH ARE DISTURBED AFTER OCTOBER 15", SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
      (C) AFTER NOVEMBER 30" INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE SEASON, SHALL BE PROTECTED IN ACCORDANCE WITH TABLE 1.
      (D) WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE PROJECT IS WITHOUT STABILIZATION AT ONE TIME, UNLESS A WINTER CONSTRUCTION PLAN HAS BEEN APPROVED BY NHDOT THAT MEETS THE REQUIREMENTS OF ENV-WQ 1505.02 AND ENV-WQ 1505.05.
      (E) A SWPPP AMENDMENT SHALL BE SUBMITTED TO THE DEPARTMENT, FOR APPROVAL, ADDRESSING COLD WEATHER STABILIZATION (ENV-WQ 1505.05) AND INCLUDING THE REQUIREMENTS OF NO LESS THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF WORK SCHEDULED AFTER NOVEMBER 30".

GENERAL CONSTRUCTION PLANNING AND SELECTION OF STRATEGIES TO CONTROL EROSION AND SEDIMENT ON HIGHWAY CONSTRUCTION PROJECTS

3. PLAN ACTIVITIES TO ACCOUNT FOR SENSITIVE SITE CONDITIONS:
   3.1. CLEARLY FLAG AREAS TO BE PROTECTED IN THE FIELD AND PROVIDE CONSTRUCTION BARRIERS TO PREVENT TRAFFICKING OUTSIDE OF WORK AREAS.
   3.2. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS.
   3.3. PROTECT AND MAXIMIZE EXISTING NATIVE VEGETATION AND NATURAL FOREST BUFFERS BETWEEN CONSTRUCTION ACTIVITY AND SENSITIVE AREAS.
   3.4. WHEN WORK IS PERFORMED IN AND NEAR WATER COURSES, STREAM FLOW DIVERSION METHODS SHALL BE IMPLEMENTED PRIOR TO ANY EXCAVATION OR FILLING.
   3.5. WHEN WORK IS PERFORMED WITHIN 50 FEET OF SURFACE WATERS (WETLAND, OPEN WATER OR FLOWING WATER), PERIMETER CONTROL SHALL BE ENHANCED CONSISTENT WITH SECTION 2.1.2.1. OF THE 2012 NPDES CONSTRUCTION GENERAL PERMIT.

4. MINIMIZE THE AMOUNT OF EXPOSED SOIL:
   4.1. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS. MINIMIZE THE AREA OF EXPOSED SOIL AT ANY ONE TIME. PHASING SHALL BE USED TO REDUCE THE AMOUNT AND DURATION OF SOIL EXPOSED TO THE ELEMENTS AND VEHICLE TRACKING.
   4.2. UTILIZE TEMPORARY MULCHING OR PROVIDE ALTERNATE TEMPORARY STABILIZATION ON EXPOSED SOILS IN ACCORDANCE WITH TABLE 1.
   4.3. THE MAXIMUM AMOUNT OF DISTURBED EARTH SHALL NOT EXCEED A TOTAL OF 5 ACRES FROM MAY 1" THROUGH NOVEMBER 30", OR EXCEED ONE ACRE DURING WINTER MONTHS, UNLESS THE CONTRACTOR DEMONSTRATES TO THE DEPARTMENT THAT THE ADDITIONAL AREA OF DISTURBANCE IS NECESSARY TO MEET THE CONTRACTORS CRITICAL PATH METHOD SCHEDULE (CPM), AND THE CONTRACTOR HAS ADEQUATE RESOURCES AVAILABLE TO ENSURE THAT ENVIRONMENTAL COMMITMENTS WILL BE MET.

5. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT:
   5.1. DIVERT OFF SITE RUNOFF OR CLEAN WATER AWAY FROM THE CONSTRUCTION ACTIVITY TO REDUCE THE VOLUME THAT NEEDS TO BE TREATED ON SITE.
   5.2. DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM DISTURBED AREAS, SLOPES, AND AROUND ACTIVE WORK AREAS AND TO A STABILIZED OUTLET LOCATION.
   5.3. CONSTRUCT IMPERMEABLE BARRIERS AS NECESSARY TO COLLECT OR DIVERT CONCENTRATED FLOWS FROM WORK OR DISTURBED AREAS.
   5.4. STABILIZE, TO APPROPRIATE ANTICIPATED VELOCITIES, CONVEYANCE CHANNELS OR PUMPING SYSTEMS NEEDED TO CONVEY CONSTRUCTION STORMWATER TO BASINS AND DISCHARGE LOCATIONS PRIOR TO USE.
   5.5. DIVERT OFF-SITE WATER THROUGH THE PROJECT IN AN APPROPRIATE MANNER SO NOT TO DISTURB THE UPSTREAM OR DOWNSTREAM SOILS, VEGETATION OR HYDROLOGY BEYOND THE PERMITTED AREA.

6. PROTECT SLOPES:
   6.1. INTERCEPT AND DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM UNPROTECTED AND NEWLY ESTABLISHED AREAS AND SLOPES TO A STABILIZED OUTLET OR CONVEYANCE.
   6.2. CONSIDER HOW GROUNDWATER SEEPAGE ON CUT SLOPES MAY IMPACT SLOPE STABILITY AND INCORPORATE APPROPRIATE MEASURES TO MINIMIZE EROSION.
   6.3. CONVEY STORMWATER DOWN THE SLOPE IN A STABILIZED CHANNEL OR SLOPE DRAIN.
   6.4. THE OUTER FACE OF THE FILL SLOPE SHOULD BE IN A LOOSE RUFFLED CONDITION PRIOR TO TURF ESTABLISHMENT. TOPSOIL OR HUMUS LAYERS SHALL BE TRACKED UP AND DOWN THE SLOPE, DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO PRODUCE A RUFFLED SURFACE.

7. ESTABLISH STABILIZED CONSTRUCTION EXITS:
   7.1. INSTALL AND MAINTAIN CONSTRUCTION EXITS, ANYWHERE TRAFFIC LEAVES A CONSTRUCTION SITE ONTO A PUBLIC RIGHT-OF-WAY.
   7.2. SWEEP ALL CONSTRUCTION RELATED DEBRIS AND SOIL FROM THE ADJACENT PAVED ROADWAYS AS NECESSARY.

8. PROTECT STORM DRAIN INLETS:
   8.1. DIVERT SEDIMENT LADEN WATER AWAY FROM INLET STRUCTURES TO THE EXTENT POSSIBLE.
   8.2. INSTALL SEDIMENT BARRIERS AND SEDIMENT TRAPS AT INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.
   8.3. CLEAN CATCH BASINS, DRAINAGE PIPES, AND CULVERTS IF SIGNIFICANT SEDIMENT IS DEPOSITED.
   8.4. DROP INLET SEDIMENT BARRIERS SHOULD NEVER BE USED AS THE PRIMARY MEANS OF SEDIMENT CONTROL AND SHOULD ONLY BE USED TO PROVIDE AN ADDITIONAL LEVEL OF PROTECTION TO STRUCTURES AND DOWN-GRADIENT SENSITIVE RECEPTORS.

9. SOIL STABILIZATION:
   9.1. WITHIN THREE DAYS OF THE LAST ACTIVITY IN AN AREA, ALL EXPOSED SOIL AREAS, WHERE CONSTRUCTION ACTIVITIES ARE COMPLETE, SHALL BE STABILIZED.
   9.2. IN ALL AREAS, TEMPORARY SOIL STABILIZATION MEASURES SHALL BE APPLIED IN ACCORDANCE WITH THE STABILIZATION REQUIREMENTS (SECTION 2.2) OF THE 2012 CGP. (SEE TABLE 1 FOR GUIDANCE ON THE SELECTION OF TEMPORARY SOIL STABILIZATION MEASURES.)
   9.3. EROSION CONTROL SEED MIX SHALL BE SOWN IN ALL INACTIVE CONSTRUCTION AREAS THAT WILL NOT BE PERMANENTLY SEEDED WITHIN TWO WEEKS OF DISTURBANCE AND PRIOR TO SEPTEMBER 15, OF ANY GIVEN YEAR, IN ORDER TO ACHIEVE VEGETATIVE STABILIZATION PRIOR TO THE END OF THE GROWING SEASON.
   9.4. SOIL TACKIFIERS MAY BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND REAPPLIED AS NECESSARY TO MINIMIZE SOIL AND MULCH LOSS UNTIL PERMANENT VEGETATION IS ESTABLISHED.

10. RETAIN SEDIMENT ON-SITE AND CONTROL DEWATERING PRACTICES:
   10.1. TEMPORARY SEDIMENT BASINS (CGP-SECTION 2.1.3.2) OR SEDIMENT TRAPS (ENV-WQ 1506.10) SHALL BE SIZED TO RETAIN, ON SITE, THE VOLUME OF A 2-YEAR 24-HOUR STORM EVENT FOR ANY AREA OF DISTURBANCE OR 3,600 CUBIC FEET OF STORMWATER RUNOFF PER ACRE OF DISTURBANCE, WHICHEVER IS GREATER. TEMPORARY SEDIMENT BASINS USED TO TREAT STORMWATER RUNOFF FROM AREAS GREATER THAN 5-ACRES OF DISTURBANCE SHALL BE SIZED TO ALSO CONTROL STORMWATER RUNOFF FROM A 10-YEAR 24 HOUR STORM EVENT. ON-SITE RETENTION OF THE 10-YEAR 24-HOUR EVENT IS NOT REQUIRED.
   10.2. CONSTRUCT AND STABILIZE DEWATERING INFILTRATION BASINS PRIOR TO ANY EXCAVATION THAT MAY REQUIRE DEWATERING.
   10.3. TEMPORARY SEDIMENT BASINS OR TRAPS SHALL BE PLACED AND STABILIZED AT LOCATIONS WHERE CONCENTRATED FLOW (CHANNELS AND PIPES) DISCHARGE TO THE SURROUNDING ENVIRONMENT FROM AREAS OF UNSTABILIZED EARTH DISTURBING ACTIVITIES.

11. ADDITIONAL EROSION AND SEDIMENT CONTROL GENERAL PRACTICES:
   11.1. USE TEMPORARY MULCHING, PERMANENT MULCHING, TEMPORARY VEGETATIVE COVER, AND PERMANENT VEGETATIVE COVER TO REDUCE THE NEED FOR DUST CONTROL. USE MECHANICAL SWEEPERS ON PAVED SURFACES WHERE NECESSARY TO PREVENT DUST BUILDUP. APPLY WATER, OR OTHER DUST INHIBITING AGENTS OR TACKIFIERS, AS APPROVED BY THE NHDES.
   11.2. ALL STOCKPILES SHALL BE CONTAINED WITH TEMPORARY PERIMETER CONTROLS. INACTIVE SOIL STOCKPILES SHOULD BE PROTECTED WITH SOIL STABILIZATION MEASURES (TEMPORARY EROSION CONTROL SEED MIX AND MULCH, SOIL BINDER) OR COVERED WITH ANCHORED TARPS.
   11.3. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED IN ACCORDANCE WITH SECTION 645 OF NHDOT SPECIFICATIONS, WEEKLY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.25 IN. OF RAIN PER 24-HOUR PERIOD. EROSION AND SEDIMENT CONTROL MEASURES WILL ALSO BE INSPECTED IN ACCORDANCE WITH THE GUIDANCE MEMO FROM THE NHDES CONTAINED WITHIN THE CONTRACT PROPOSAL AND THE EPA CONSTRUCTION GENERAL PERMIT.
   11.4. THE CONTRACTOR SHOULD UTILIZE STORM DRAIN INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING A STORM DRAINAGE SYSTEM PRIOR TO THE PERMANENT STABILIZATION OF THE CONTRIBUTING DISTURBED AREA.
   11.5. PERMANENT STABILIZATION MEASURES WILL BE CONSTRUCTED AND MAINTAINED IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS TO STABILIZE AREAS. VEGETATIVE STABILIZATION SHALL NOT BE CONSIDERED PERMANENTLY STABILIZED UNTIL VEGETATIVE GROWTH COVERS AT LEAST 85% OF THE DISTURBED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL FOR ONE YEAR AFTER PROJECT COMPLETION.
   11.6. CATCH BASINS: CARE SHALL BE TAKEN TO ENSURE THAT SEDIMENTS DO NOT ENTER ANY EXISTING CATCH BASINS DURING CONSTRUCTION. THE CONTRACTOR SHALL PLACE TEMPORARY STONE INLET PROTECTION OVER INLETS IN AREAS OF SOIL DISTURBANCE THAT ARE SUBJECT TO SEDIMENT CONTAMINATION.
   11.7. TEMPORARY AND PERMANENT DITCHES SHALL BE CONSTRUCTED, STABILIZED AND MAINTAINED IN A MANNER THAT WILL MINIMIZE SCOUR. TEMPORARY AND PERMANENT DITCHES SHALL BE DIRECTED TO DRAIN TO SEDIMENT BASINS OR STORM WATER COLLECTION AREAS.
   11.8. WINTER EXCAVATION AND EARTHWORK ACTIVITIES NEED TO BE LIMITED IN EXTENT AND DURATION, TO MINIMIZE POTENTIAL EROSION AND SEDIMENTATION IMPACTS. THE AREA OF EXPOSED SOIL SHALL BE LIMITED TO ONE ACRE, OR THAT WHICH CAN BE STABILIZED AT THE END OF EACH DAY UNLESS A WINTER CONSTRUCTION PLAN, DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, IS REVIEWED AND APPROVED BY THE DEPARTMENT.
   11.9. CHANNEL PROTECTION MEASURES SHALL BE SUPPLEMENTED WITH PERIMETER CONTROL MEASURES WHEN THE DITCH LINES OCCUR AT THE BOTTOM OF LONG FILL SLOPES. THE PERIMETER CONTROLS SHALL BE INSTALLED ON THE FILL SLOPE TO MINIMIZE THE POTENTIAL FOR FILL SLOPE SEDIMENT DEPOSITS IN THE DITCH LINE.

BEST MANAGEMENT PRACTICES (BMP) BASED ON AMOUNT OF OPEN CONSTRUCTION AREA

12. STRATEGIES SPECIFIC TO OPEN AREAS LESS THAN 5 ACRES:
   12.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500: ALTERATION OF TERRAIN FOR CONSTRUCTION AND USE ALL CONVENTIONAL BMP STRATEGIES.
   12.2. SLOPES STEEPER THAN 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING.
   12.3. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT ALONE.
   12.4. AREAS WHERE HAUL ROADS ARE CONSTRUCTED AND STORMWATER CANNOT BE TREATED THE DEPARTMENT WILL CONSIDER INFILTRATION.
   12.5. FOR HAUL ROADS ADJACENT TO SENSITIVE ENVIRONMENTAL AREAS OR STEEPER THAN 5%, THE DEPARTMENT WILL CONSIDER USING EROSION STONE, CRUSHED GRAVEL, OR CRUSHED STONE BASE TO HELP MINIMIZE EROSION ISSUES.
   12.6. ALL AREAS THAT CAN BE STABILIZED SHALL BE STABILIZED PRIOR TO OPENING UP NEW TERRITORY.
   12.7. DETENTION BASINS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE A 2 YEAR STORM EVENT.

13. STRATEGIES SPECIFIC TO OPEN AREAS BETWEEN 5 AND 10 ACRES:
   13.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES WILL BE UTILIZED.
   13.2. DETENTION BASINS WILL BE CONSTRUCTED TO ACCOMMODATE THE 2-YEAR 24-HOUR STORM EVENT AND CONTROL A 10-YEAR 24-HOUR STORM EVENT.
   13.3. SLOPES STEEPER THAN A 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS. OTHER ALTERNATIVE MEASURES, SUCH AS BONDED FIBER MATRIXES (BFMS) OR FLEXIBLE GROWTH MEDIUMS (FGMS) MAY BE UTILIZED, IF MEETING THE NHDES APPROVALS AND REGULATIONS.
   13.4. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS.

14. STRATEGIES SPECIFIC TO OPEN AREAS OVER 10 ACRES:
   14.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES AND BETWEEN 5 AND 10 ACRES WILL BE UTILIZED.
   14.2. THE DEPARTMENT ANTICIPATES THAT SOIL BINDERS WILL BE NEEDED ON ALL SLOPES STEEPER THAN 3:1, IN ORDER TO MINIMIZE EROSION AND REDUCE THE AMOUNT OF SEDIMENT IN THE STORMWATER TREATMENT BASINS.
   14.3. THE CONTRACTOR WILL BE REQUIRED TO HAVE AN APPROVED DESIGN IN ACCORDANCE WITH ENV-WQ 1506.12 FOR AN ACTIVE FLOCCULANT TREATMENT SYSTEM TO TREAT AND RELEASE WATER CAPTURED IN STORM WATER BASINS. THE CONTRACTOR SHALL ALSO RETAIN THE SERVICES OF AN ENVIRONMENTAL CONSULTANT WHO HAS DEMONSTRATED EXPERIENCE IN THE DESIGN OF FLOCCULANT TREATMENT SYSTEMS. THE CONSULTANT WILL ALSO BE RESPONSIBLE FOR THE IMPLEMENTATION AND MONITORING OF THE SYSTEM.

TABLE 1
GUIDANCE ON SELECTING TEMPORARY SOIL STABILIZATION MEASURES

APPLICATION AREAS	DRY MULCH METHODS				HYDRAULICALLY APPLIED MULCHES[2]				ROLLED EROSION CONTROL BLANKETS[3]			
	HMT	WC	SG	CB	HM	SMM	BFM	FRM	SNSB	DNSB	DNSCB	DNCB
SLOPES[1]												
STEEPER THAN 2:1	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
2:1 SLOPE	YES*	YES*	YES	YES	NO	NO	YES	YES	NO	YES	YES	YES
3:1 SLOPE	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	NO
4:1 SLOPE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
WINTER STABILIZATION	4T/AC	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
CHANNELS												
LOW FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
HIGH FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES

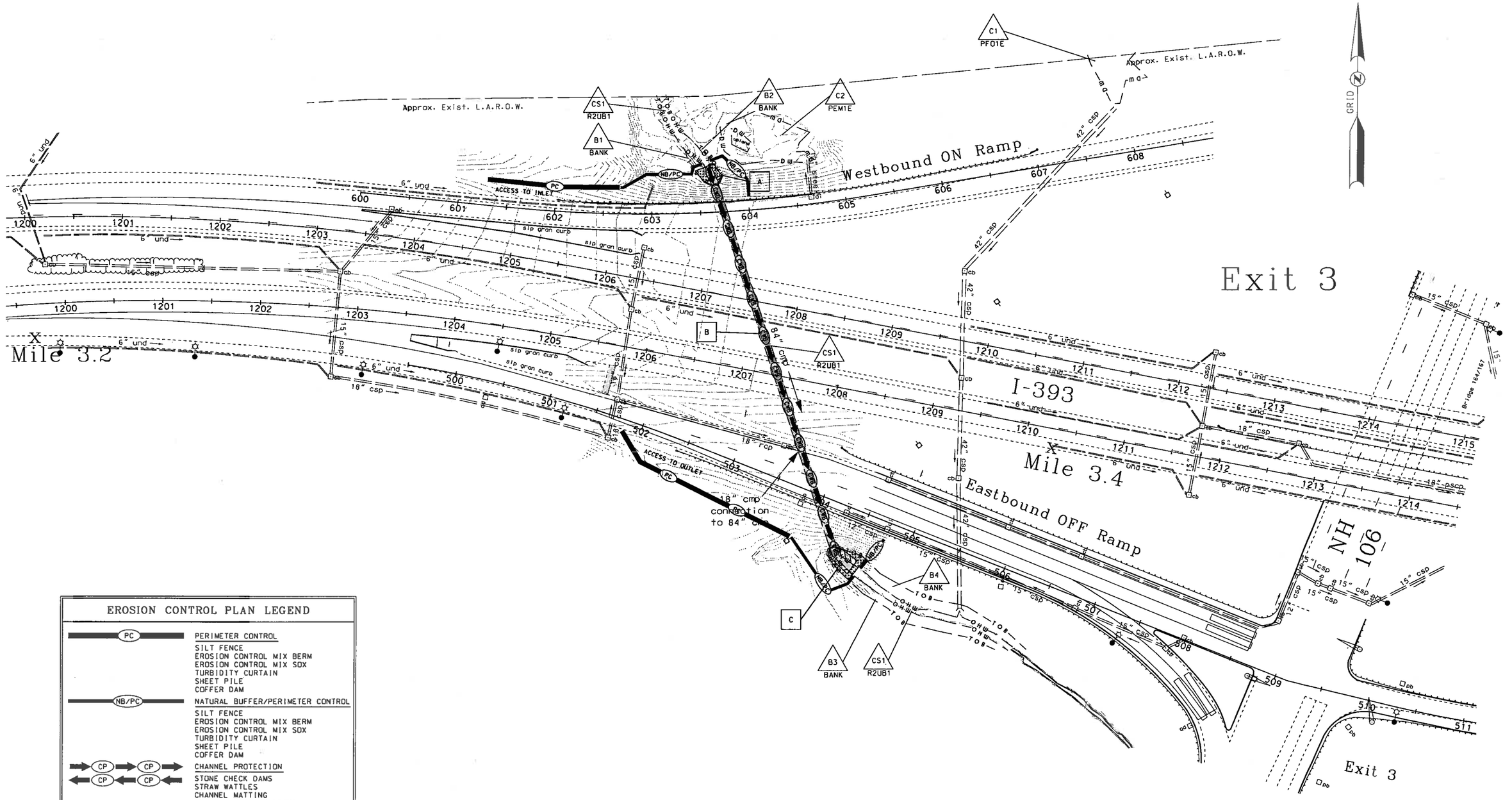
ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE
HMT	HAY MULCH & TACK	HM	HYDRAULIC MULCH	SNSB	SINGLE NET STRAW BLANKET
WC	WOOD CHIPS	SMM	STABILIZED MULCH MATRIX	DNSB	DOUBLE NET STRAW BLANKET
SG	STUMP GRINDINGS	BFM	BONDED FIBER MATRIX	DNSCB	2 NET STRAW-COCONUT BLANKET
CB	COMPOST BLANKET	FRM	FIBER REINFORCED MEDIUM	DNCB	2 NET COCONUT BLANKET

NOTES:
1. ALL SLOPE STABILIZATION OPTIONS ASSUME A SLOPE LENGTH ≤10 TIMES THE HORIZONTAL DISTANCE COMPONENT OF THE SLOPE, IN FEET.
2. PRODUCTS CONTAINING POLYACRYLAMIDE (PAM) SHALL NOT BE APPLIED DIRECTLY TO OR WITHIN 100 FEET OF ANY SURFACE WATER WITHOUT PRIOR WRITTEN APPROVAL FROM THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES.
3. ALL EROSION CONTROL BLANKETS SHALL BE MADE WITH WILDLIFE FRIENDLY BIODEGRADABLE NETTING.

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

EROSION CONTROL STRATEGIES

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
12-21-2015	41267erosstrat	41267	8	10



EROSION CONTROL PLAN LEGEND

PC	PERIMETER CONTROL
	SILT FENCE
	EROSION CONTROL MIX BERM
	EROSION CONTROL MIX SOX
	TURBIDITY CURTAIN
	SHEET PILE
	COFFER DAM
NB/PC	NATURAL BUFFER/PERIMETER CONTROL
	SILT FENCE
	EROSION CONTROL MIX BERM
	EROSION CONTROL MIX SOX
	TURBIDITY CURTAIN
	SHEET PILE
	COFFER DAM
CP CP	CHANNEL PROTECTION
CP CP	STONE CHECK DAMS
	STRAW WATTLES
	CHANNEL MATTING
	CLASS D EROSION STONE
	CLASS C STONE
CWB CWB	CLEAN WATER BYPASS
CWB CWB	PUMP THROUGH PIPE
	DRAIN THROUGH PIPE OR CHANNEL

NO CHANGE TO EXISTING TOPOGRAPHY
CONTOUR INTERVAL 1 FOOT

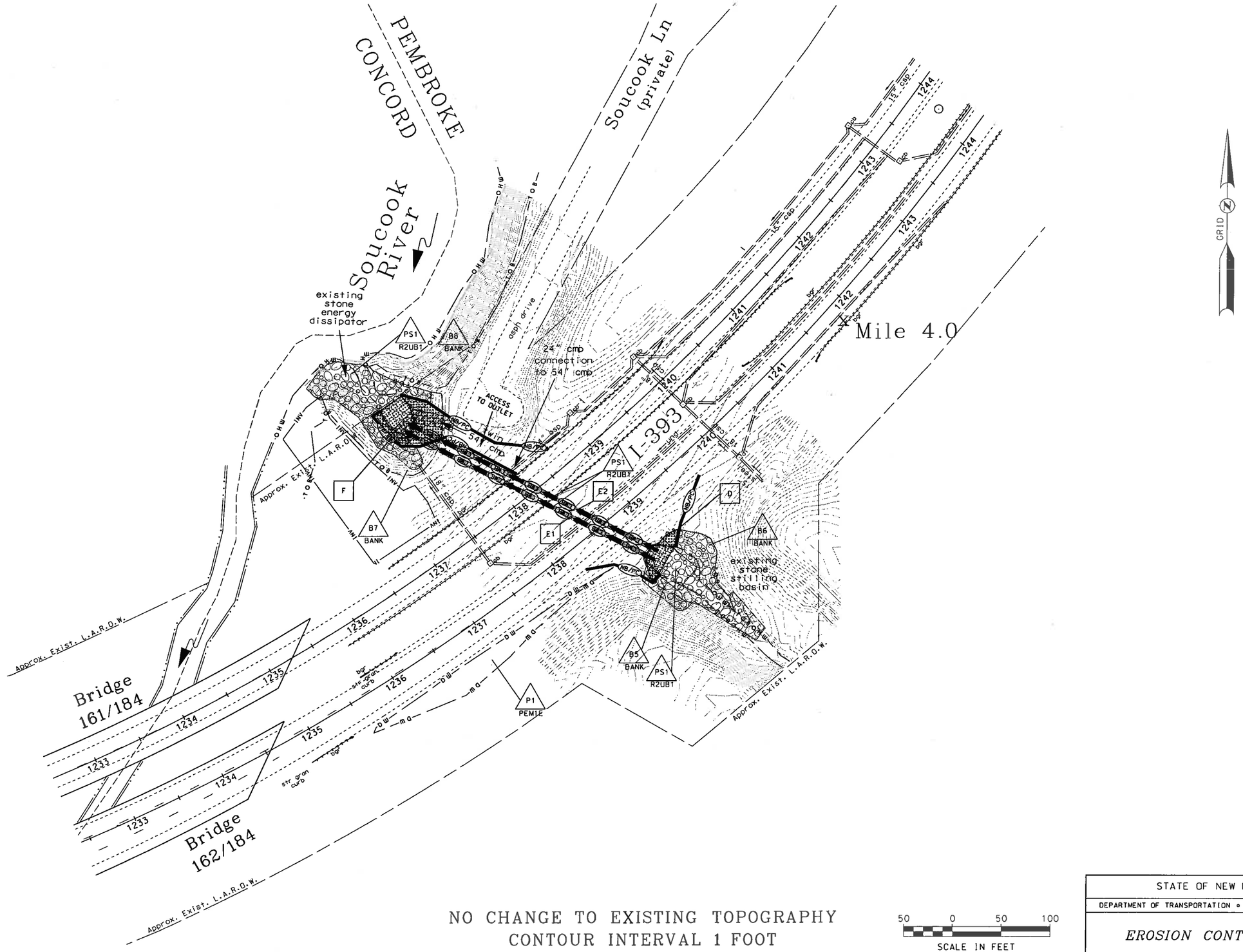
50 0 50 100
SCALE IN FEET

DESCRIPTION	STATION	DATE	NUMBER
NEW DESIGN SDF		DATE APRIL 2018	
SHEET CHECKED CAC		DATE 5/2018	
AS BUILT DETAILS		DATE	

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

EROSION CONTROL PLANS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
41267wetplans	41267	9	10



NO CHANGE TO EXISTING TOPOGRAPHY
CONTOUR INTERVAL 1 FOOT

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

EROSION CONTROL PLANS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
41267wetplans	41267	10	10

NUMBER	DATE	STATION	DESCRIPTION

NEW DESIGN SDF DATE APRIL 2018
SHEET CHECKED CAC DATE 5/2018
AS BUILT DETAILS DATE